

FLIGHT

The
AIRCRAFT ENGINEER
AND AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor : STANLEY SPOONER

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport
OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 1251. (Vol. XXIV. No. 51.)

DECEMBER 15, 1932

Weekly, Price 6d.
Post Free, 7½d. Abroad, 8d.

Editorial Offices : 36, GREAT QUEEN STREET, KINGSWAY, W.C.2.
Telephone : (2 lines), Holborn 3211 and 1884.
Telegrams : Truditur, Westcent, London.

Subscription Rates, Post Free.

UNITED KINGDOM	UNITED STATES	OTHER COUNTRIES
3 Months ... 8 3	3 Months ... \$2.20	3 Months ... 8 9
6 " " 16 6	6 " " \$4.40	6 " " 17 6
12 " " 33 0	12 " " \$8.75	12 " " 35 0

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DIARY OF CURRENT AND FORTHCOMING EVENTS

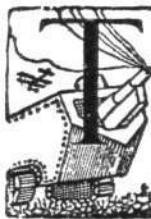
Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list :—

- 1932.
- Dec. 15. Forum Club, Aviation Group, Dinner to Women Private Owners and Pilots.
 - Dec. 16. College of Aeronautical Engineering Annual Dinner and Dance, Park Lane Hotel.
 - Dec. 16. No. 70 Sqdn., R.A.F., Reunion Dinner at R.A.F. Club.
 - Dec. 19. R.Ae.C. and R.Ae.S. Dinner to Mrs. Mollison at Park Lane Hotel.
 - Dec. 20. " Slots." Lecture by B. Cornthwaite before R.Ae.S., Students' Section. Chairman, F. Handley Page.
 - Dec. 23. Liverpool and Dis. Ae.C., Annual Dance at Mostyn House School.
 - Dec. 23. Eastern Counties Ae.C. Dance at Gt. White Horse Hotel, Ipswich.
- 1933.
- Jan. 6. Bristol and Wessex Ae.C. Dance at Grand Spa Hotel.
 - Jan. 6. No. 25 (F.) Sqdn., R.A.F., Re-union Dinner at May Fair Hotel.
 - Jan. 11. B.G.A. Ball in Honour of Mrs. Mollison at Portman Rooms.
 - Jan. 12. " Airship Development Abroad." Lecture by Sqdn.-Ldr. R. S. Booth before R.Ae.S.
 - Jan. 26-28. Forest Gate Aviation Show.
 - Jan. 31. " Detonation." Lecture by F. R. B. King before R.Ae.S., Students' Section. Chairman, H. T. Tizard.
 - Feb. 1. Entries close for the Deutsche de la Meurthe Cup (Aero Club de France).
 - Feb. 3. Cinque Ports Flying Club Annual Dinner and Dance at R.L. Pavilion Hotel, Folkestone.
 - Feb. 8. " Recent Operations in Kurdistan." Lecture by Group-Capt. A. G. R. Garrod before R.U.S.I.
 - Feb. 10. Viceroy's Challenge Trophy Race, Delhi.
 - Feb. 13. " A Review of Air Transport." Lecture by G. E. Woods Humphrey before Inst. of Transport.
 - June 24. Royal Air Force Display, Hendon.

CHRISTMAS HOLIDAYS

Owing to the holidays " FLIGHT " must close for Press for the issues of Dec. 22nd and 29th earlier. All communications and copy (Editorial and Advertisement), therefore, must arrive at this office not later than the morning of Dec. 15th (for Dec. 22nd issue) and Dec. 20th (for Dec. 29th issue).

EDITORIAL COMMENT



THE report of the Inter-Departmental Committee on Australian air services, and the decision of the Federal Government which has followed the publication, are very satisfactory. Taken together, these two pronouncements ensure that air mails from Great Britain to Australia shall be carried by British agency only. They provide that Australia shall be responsible for the service as far west as Singapore. They also provide for the continuance of the most important of the internal air lines of Australia, probably on a more economical basis; and, finally, they propose to put the important Melbourne-Tasmania service on a subsidised basis. A lesser, but still important point is that Darwin, not Wyndham, is decided on as the air port for the Britain-Australia service.

As regards the service to Britain, three proposals have been in the field. One was that the Dutch Air Lines (KLM) should extend its route from Batavia to Australia. The Dutch offer was apparently a handsome one, as it asked for no subsidy, and professed its readiness to make way for a British concern so soon as any should be ready to take over. To have accepted it would probably have meant an almost immediate institution of an air link with Europe, and that must have been tempting. Australia has, however, decided that only British concerns may tender for the contract. We feel convinced that this decision is not only patriotic but wise. To have done anything else would have been contrary to the

spirit of Ottawa. In the long run we feel sure that Australia and Great Britain alike will benefit by reserving their Empire air lines to British operation and British equipment. Air transport is going to be a very big business in the future, and all parts of the Empire should work together in its development.

Whether it will prove better for Australia to operate the section Darwin-Singapore than it would have been to leave this to the wide experience of Imperial Airways, is not a matter on which a confident opinion can be expressed. The two main Australian companies, West Australia Airways and Qantas, are both very experienced in operation inside Australia, but have as yet no experience of overseas work. Presumably the matter will be settled by agreement, for Australia does not govern the section from Darwin to Singapore, and cannot decide by herself that Australian companies shall have a monopoly on it. Possibly, Imperial Airways will be well content to join hands with the Australians at Singapore, for it does not yet emerge who, if anybody, is going to subsidise them for flying onwards from Karachi.

It appears that the contract for this service from Darwin to Singapore is likely to go to a combine composed of West Australia Airways, Qantas, and Australian National Airways.

The scheme for the new arrangement of internal air services in Australia is at least as interesting as the arrangements for the external service. The Perth-Wyndham service of West Australia Airways and the Brisbane-Camooweal service of Qantas have done such magnificent work in the past, not only by bringing the "out back" in touch with civilisation and medical aid, but also in demonstrating how safely, how reliably, and how economically air services can be run, that any threat to their continuance

would be a disaster. It now seems certain that these services will be continued, though on a slightly different basis. What the subsidy rates will be has not been stated. The main internal air mail service will run from Darwin through Katherine, Daly Waters, Camooweal, and down the old Qantas route to Charleville and then on the Cootamundra in New South Wales, where the mails will be transferred to the railways for Sydney, Melbourne and Adelaide. From this trunk line there will be an important branch from Charleville to Brisbane and another in the north from Camooweal to Normanton, near the Gulf of Carpentaria.

It would seem probable that all of this route as far south as Charleville and Brisbane will be entrusted to the experienced Qantas, but, of course, tenders must be offered and accepted. The section Charleville-Cootamundra is new, and may fall to the care of Australian National Airways. Mr. Ulm and Sir Charles Kingsford Smith founded that company, and once carried on some services very successfully without any subsidy. They should do still better as Government contractors. They may also get the contract for the Melbourne-Tasmania service, which

they were actually working when they were obliged to cease operations.

One State capital remains to be provided for, namely, Perth. The old route from Perth to Derby is to remain, and doubtless Major Norman Brearley will be successful in securing the contract for West Australia Airways. An extension, however, is called for, to join the main trunk line at Katherine, some 150 miles south of Darwin, and there is to be a branch line from Hall's Creek up to Wyndham. This last has also been worked by West Australia Airways, though only for half of each year.



THE LATE SIR SEFTON BRANCKER.
A portrait painted for the Royal Aero Club by Capt. E. Newling which was unveiled by Lord Gorell at the House Dinner on December 14.

1932 - 1933

To our many friends at Home & Overseas,
"Flight" offers Hearty Christmas
Greetings & Good Wishes
for the New
Year

Engine Features from the Paris Show

By MAJOR G. P. BULMAN, O.B.E., B.Sc., F.R.Ae.S.

Major Bulman is, of course, well known to everyone connected with British aviation, but for the benefit of foreign and overseas readers it should be pointed out that he is Assistant Director (Engines) of Technical Development and Scientific Research at the British Air Ministry. In his official capacity Major Bulman visited the Paris Aero Show on behalf of the Air Ministry to study the progress made during the two years that have elapsed since the last show. The following notes are, Major Bulman points out, based upon personal opinions and do not necessarily reflect the views of the Air Ministry. We consider ourselves privileged to have an article by such an eminent authority on aero engines, and feel certain that not only our ordinary readers but also aero engine and aircraft designers at home and abroad will read the article with the greatest interest.

THE Aeronautical Correspondents of the lay Press appeared for the most part to find the 13th *Salon de l'Aéronautique*, recently held in Paris, unexciting. In terms of aircraft, the enforced absence of the new French fighters undergoing competitive flight trial or, at least, still withheld from public criticism, was, naturally, disappointing to the visitor anxious to compare the relative progress of French military technique with that of his own country; but there was no lack of significance to the openminded concerned with aircraft engines. This Salon appeared to the author, indeed, to be the most interesting of all held since the war, portending a renaissance in French engine development, stung into anxious activity undoubtedly by the obvious superiority of the British exhibits at the 1930 Salon, the Schneider Trophy and Speed Record victories in 1931, and the notable purchases, meanwhile, by other foreign countries, of British aircraft and engines. It would be foolish for us now to underrate the challenge so gallantly made; and lacking in perspective, too, if we became unduly disturbed at the startling weights per horsepower and the rated altitudes claimed for the new French types homologated or untested as they may be, compared with the performance of current British engines well established in R.A.F. use and buttressed with log-book records amassing thousands of hours of routine operation.

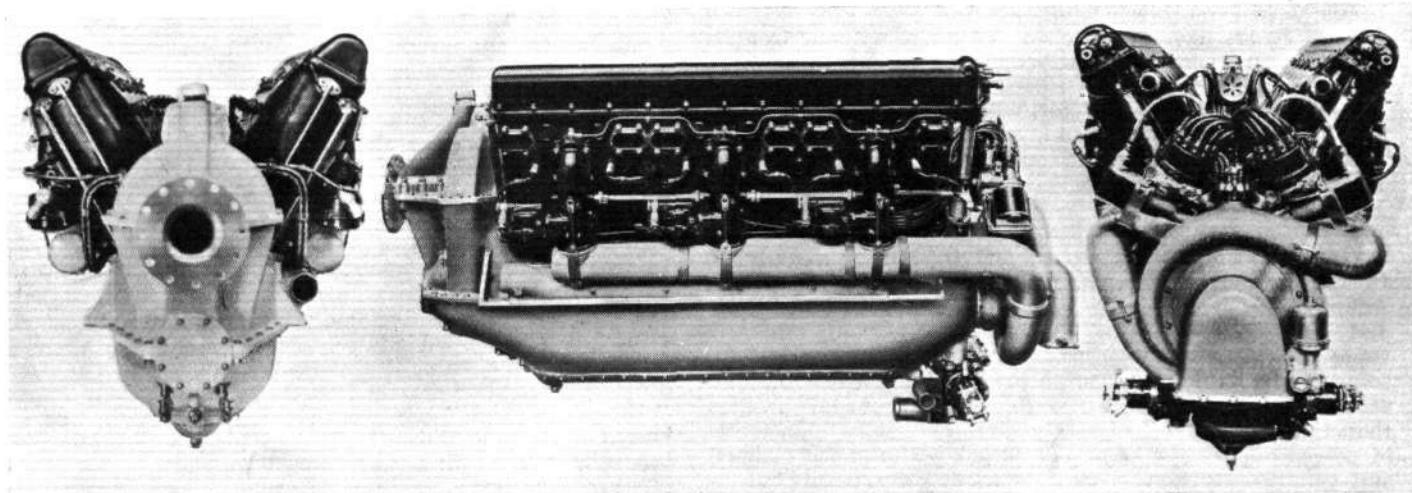
The essential change in French engine outlook is that supercharging has become universal, whereas in 1930 the Farman multi-speed blower was the only tangible evidence of interest in this direction.

It is now a French Government requirement that new types should be supercharged to at least 3,500 metres, but in practice rated altitudes of 4,500 or 5,000 metres are being attempted. Moreover, French supercharging is associated, by Government requirement, with ground boosting on a common basis. A new "standard atmosphere" has been laid down for blower engines, e.g., 880 millimetres or approximately 2 lb. boost for take off, the rated altitude, however, being determined for the most part by the height at which normal pressure, v.g., 760 millimetres, is maintained or, rather, restored. This endeavour to regain

altitude performance and higher take off power is associated with an important step in providing a superior fuel for the new types of some 80 octane value, compared with the current French standard of some 74 octane. The better fuel appears, at present, to be obtained by benzole addition, but the introduction of T.E.L. is undoubtedly foreshadowed for the near future. Two standards of fuel, at any rate, are envisaged, offering an obvious advantage to the French engine designer not confined to producing engines which will live on the poorest fuel which may be available in outlying regions of normal operation.

Whereas, here, supercharging is concerned only with suction type carburetters, the French are proceeding vigorously with the pressure system, i.e., the blower delivers air under pressure to the carburetter and not vice versa.

The pressure system is obviously attractive, if for no other reason, in facilitating the attachment of the supercharger to a hitherto normally aspirated engine with a minimum of disturbance to the induction pipe layout and the carburetter itself, the latter modified, of course, to provide a pressure balance system to the float chamber, less difficult now than formerly, thanks to the general introduction of petrol pressure pumps from the tanks. Several French exhibits, however, emphasise other contributory advantages. For supercharging air only it is assumed (though yet to be proved) that the special strengthening and rigidity of attachment of the supercharger needed to withstand backfire effect is unnecessary; the supercharger itself, then, and the piping to the carburetters, is lightened. The better distribution and homogeneity of mixture we may claim for the suction system is, at least to some extent, balanced by the general French use of multi-carburetters anyhow. As to whether a lower induction temperature is obtained by cooling compressed air heated in the blower by passing it through the carburetter than by feeding the blower with mixture already depressed in temperature, is a matter for argument, but there is no doubt that by the pressure system freezing tendencies in the carburetter itself are markedly reduced, and the need for elaborate drainage of the blower volute



THE NEW HISPANOS : Alike in external appearance, the 12 X.B.R.S. is shown in front view on the left, and the 12 Y.B.R.S. in rear view on the right.

goes well, to the order of 4,000 r.p.m. At the lower speed (giving 1,700 airscrew speed) it is hoped to produce 450 h.p. at 5,000 m. for an unspecified weight. The cylinders are nitrogen-hardened and the connecting rods have double roller bearings running direct in the split big end of the rod and direct on to the crankshaft, which has balance weights. Cylinder centres are offset so that each connecting rod works direct on the pin.

The Farman "12 G.V.I." engine is an inverted 12-cylinder 60 deg. "V," 110-mm. bore and 110 mm. stroke, with 2-speed blower, claimed to give 510 h.p. ground level at 3,400 r.p.m., with 3½ lb. boost and 420 h.p. at 5,500 m., for a total weight of 290 kg. or 640 lb. The cylinder blocks are attached to the bottom part of the crankcase from the outside by a conventional cylinder holding-down flange, while on the inside of the "V" through-bolts to the cylinder head are provided to facilitate dismantlement and erection, a very necessary arrangement in that a single camshaft is housed in the "V" to operate on both blocks, the cylinder having two side-by-side valves, their axes approximately at 90 deg. to the cylinder stroke. Screwed plugs in the cylinder heads, two per cylinder, which at first view appear to be induction ports with induction pipes left off, are merely covers through which the valves are inserted or extracted, as in side-valve motor-car engine practice. The 2-stage blower mounted on the rear feeds six Zenith carburetters through intercoolers which, at the Salon, had to be imagined, but must, in installation, detract appreciably from the advantages offered by the compactness of the engine itself, which, over the cylinder blocks, is some 2.7 in. narrower than the "Kestrel."

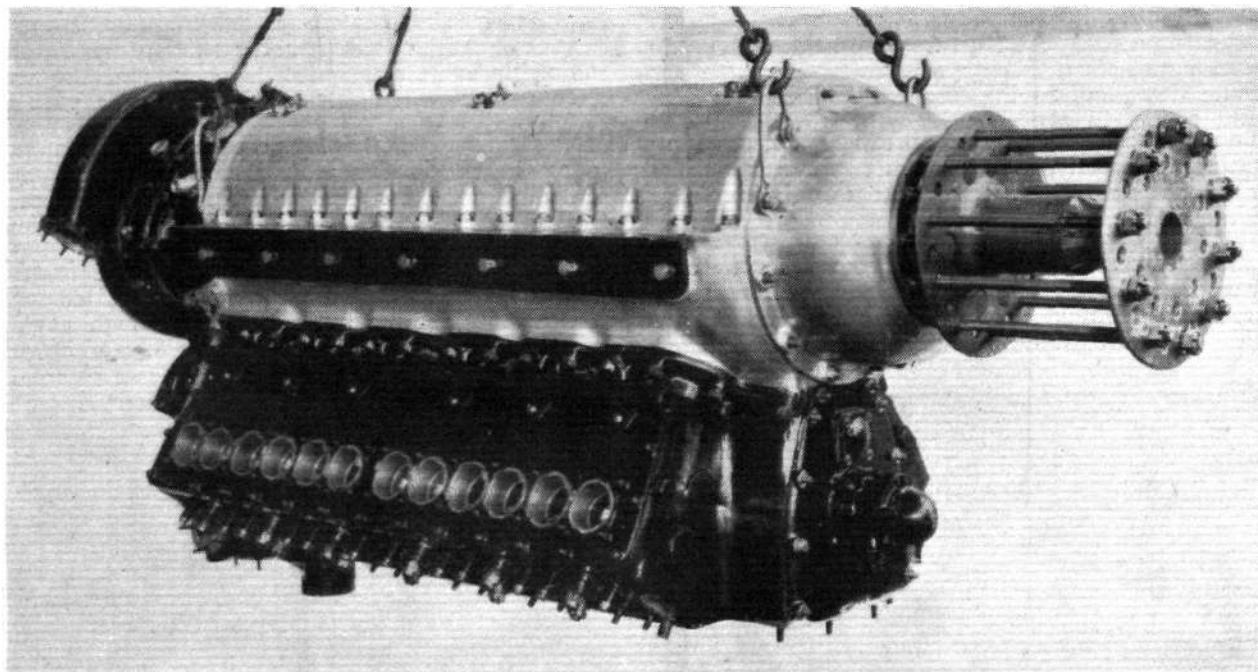
On the Italian engines there appeared to be far less advance, compared with the French. On the other hand, in 1930 the Italians were markedly ahead of the French, so that less apparent progress may well be expected.

The Fiat "A. 30 R." is an exception, inspired probably

The "A.S. 6" engine, developed for the Schneider Trophy, appears for the most part to comprise two of the above-mentioned "A. 30 R." engines tandem, the rear engine crankcase, shorn of its reduction-gear casing, butting on to the back end of the front engine, the tubular airscrew shaft of the rear engine lying in a conduit in the "V" of the front engine and passing through the latter's own airscrew shaft. The induction system comprises a large supercharger drawing from a pair of down-draught carburetters. Bearing in mind the length of the engine, measured more conveniently in yards than inches, the uniformity of distribution between the front cylinders—some 10 ft. distant, and the rear-most pair—must offer desperate difficulty. As to whether there is any special spring drive or other device to take care of resonance in the rear airscrew shaft could not, of course, be gleaned. It is claimed to produce 2,800 h.p. at 3,200 r.p.m. at a weight of 920 kilograms, e.g., some 400 lb. more than our own Schneider "R" engine, for a very doubtful advantage of 300 to 400 h.p.; indeed, 100 h.p. only, if snatch bench test readings are admissible for propaganda.

The large variety of Continental air-cooled engines are not dealt with in detail, in that, for the most part, they appear to be far inferior to both British and American types, copying, not very cleverly, the external characteristics of one or other, and claiming in some quarters performances that may be got by snatch readings, but which will assuredly fall down in actual practice.

Similarly, one was not much impressed with the variety of N.A.C.A. cowlings shown on different aircraft. Neat looking undoubtedly, and, perhaps, increasing performance of the aircraft for the short time the engine will stand up to gross under-cooling. Many examples showed a marked curve-in to the inlet of the engine, not merely detracting from the effective exposed area of the engine, but almost certainly producing a deep annular space of dead air where cooling is most wanted over the heads.

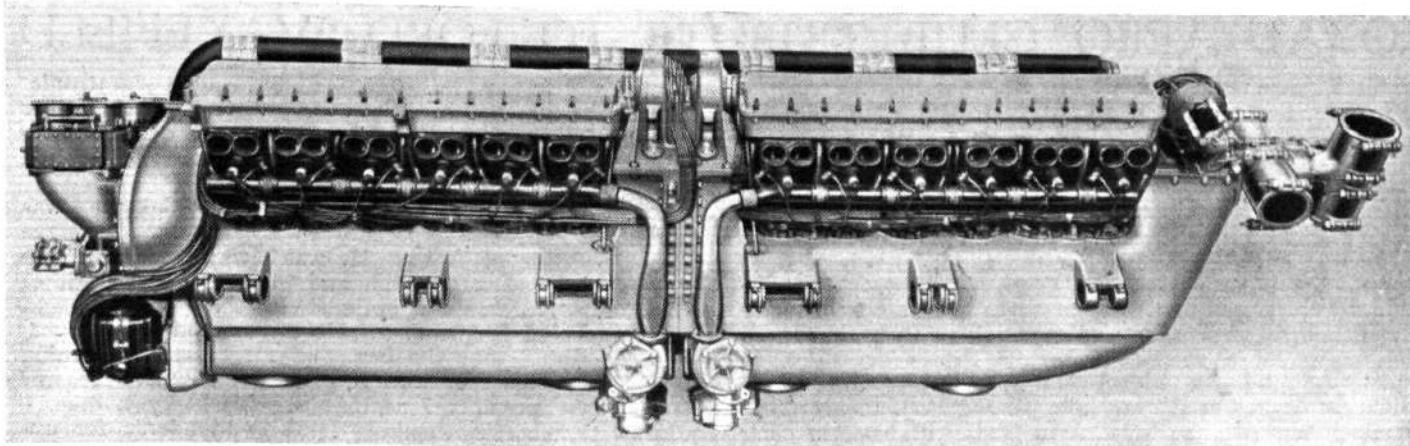


NARROWER AND NARROWER : The Farman "12 G.V.I." is, like many other new French engines, of the inverted type.

a little by the Rolls-Royce "R" engine, except that it is not supercharged and depends for its rating at 2,500 m. of 600 h.p., and 880 h.p. at ground level for 3 minutes, on its compression ratio of 8:1, having a cylinder bore 0.31 in. greater than the "Kestrel" and stroke 0.01 in. greater, with a speed of 2,600 r.p.m. and a weight of 1,027 lb. The engine is one of the few in the whole Salon fitted with an Eclipse starter, hand-operated, and an interesting accessory drive is labelled "Camera Synchroniser" (in addition, of course, to the gun-gear drive). It is understood that this engine is in a well-developed stage and in production. Special fuel for it is stated to be available at seven Italian aerodromes of 100 octane value, with large alcohol content, necessarily entailing a relatively high-fuel consumption.

There was no evidence of steam cooling, either at the Salon or in casual inquiry, but the Bleriot passenger aircraft with retractable undercarriage is fitted with wing cooling through a series of bi-metal strips along the leading edge, with small pouches, oval shaped, some 3 in. along the major axis and ¼ in. deep, spaced some three to the foot. Their purpose may be partly to inhibit ice formation on the leading edge as well as to reduce cooling head resistance, but one probable result would seem to be a freezing-up of the system.

Of compression ignition engines the Clerget appears, so far, to be alone in French achievement. The nine-cylinder T.9 type, 130 × 170 millimetres, is credited with 300 h.p. at 1,900 r.p.m., with 180 grams, e.g., 0.396 lb. per h.p. consumption, having a total weight of 330 kilo-



DUPLICITY : The Fiat Schneider engine is produced by "buttoning" two engines together, the propeller shaft of the rear engine lying in the vee of the front engine. The two co-axial propellers revolve in opposite directions.

grams, i.e., 2.4 lb. per h.p. The compression ratio is 16:1. The engine has been the subject of many years' development by Clerget himself, and is now licensed to Messrs. Hispano Suiza. Flight trials are being continued, but there would appear to be no great enthusiasm displayed for the engine. A 500-h.p. 14-cylinder type, 140 x 170, 1,900 r.p.m. normal, was exhibited, in general merely a scaled-up version of the earlier type. If this engine were successful, its weight, claimed to be 510 kilos., would clearly be important, but so far tests are probably confined purely to single-cylinder running.

The Lorraine Company also show a C.I.9-cylinder radial, 250 h.p. claimed. It evidently derives largely from the Clerget, but no information was obtainable suggestive of accomplishment as distinct from expectation.

The Compagnie Lilloise de Moteurs, an offshoot of Peugeot, exhibit a French version of the Junkers "C.I." engine, though the name is carefully excluded. They have reduced the German Jumo 5 bore of 110 millimetres to 105, however, and put on a Farman-type blower. They claim 480 h.p. at 1,900 r.p.m. for 502 kilograms, with a consumption of 0.350 lb. per h.p./hr. The engine has not yet run, and it seems somewhat hazardous, having taken the Junkers licence, to proceed at once to make important alterations in size of cylinder and claim better performance than the parent firm itself with their many years' intense development.

Airscrew shaft reduction gearing now appears to have become general rather than abnormal; all new types for Government use have flange-mounted airscrew attachments especially suitable for the employment of metal airscrews which alone are now permitted for French military use, consisting about equally of the solid dural forged blade in steel socket system and the one-piece twisted Fairey Reed or Levasseur type.

The advance of the three-bladed airscrew is particularly

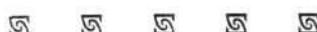
notable on a variety of types of aircraft, and it was gathered that a restriction on engine speed for gun gear operation is accepted at the lower end, *faute de mieux*.

Messrs. Gnome Rhone exhibit some 14 samples of magnesium forged airscrew blades having, evidently, well developed the process of their manufacture before submitting the product to the touchstone of practical trial.

All the airscrew development is worthy of special British consideration. It may be recalled that the flange mounting system was provisionally established here under B.E.S.A. supervision, but the "Condor" was the only engine on which it was adopted. The flange system offers some complication in the engine design to provide for assembly, but the pros and cons of the arrangement require review, particularly if there is any official intention to give preference to metal airscrews in common with the increasing practice of other countries.

To sum up, it is felt that while British engine designers are entitled to full satisfaction with the products achieved by keen competition one with another, they will be lacking in foresight and expediency if they continue to set their pace merely in relation to their British rivals. We may assume, perhaps a little too easily, that in terms of established reliability and economy of maintenance, existing British types have an invisible but effective asset to be credited to their balance sheet of inherent performance.

Engine production, won by individual firms, has its recurrent peaks and troughs of prosperity; there is no natural reason to assume that a similar cycle cannot operate in the relative advancement of different countries, whose national efforts, as well as our own, are dependent at any one time on the collective genius and travail of but a strikingly few, but dominant, personalities, whose individual power curves of achievement must, like their engines, climb to a maximum, maintain it for a time, but inevitably peak at the end.



Better Anti-Knock Fuel Wanted

In his very interesting article on the aero engines at the Paris Show, Maj. Bulman refers incidentally to the use by the French and Italian Air Ministries of special anti-knock fuels for their high-rated engines. In this country we are compelled by British Air Ministry requirements to use a fuel with an octane value of not more than 76 (D.T.D. 134 specification) in order to make available the poorer fuels obtainable in certain outlying districts in which the British Royal Air Force operates. It is felt in many quarters that the time has come to reconsider this fuel policy, as it is inevitable that the limitation imposed must affect adversely British aero engines which happen to be in direct competition abroad with aero engines of foreign make. It is, however, quite obvious from certain sentences in his article that Maj. Bulman fully realises the position, and we have no doubt that as soon as it is felt that the standardisation of a fuel with a higher octane value can safely be recommended, he will use his influence to get a new D.T.D. specification adopted.

At present the standard French fuel has an octane value

of 74, which is slightly lower than the standard British fuel, but for their new engines they are, as Maj. Bulman points out, using 80 or so. The Italians are using, for certain special squadrons, an octane value somewhere near 100, but again this is not yet a standard Italian fuel. In the United States there are, we believe, three standardised fuels with octane values of 75, 80 and 85 respectively, and as the corresponding temperature is 190 deg. C., this is equivalent to even higher values compared with the British fuel.

While this whole subject of fuel is one which cannot be lightly settled, the many pros and cons having to be very carefully weighed, it is felt that the Air Ministry should lose no time in making a decision. When British engines are competing in the world's markets with foreign engines permitted to use these fuels of high anti-knock ratings, they are handicapped through not being able to use full power at ground level for taking off, while performance at height also suffers, and sometimes there can be no doubt that foreign engine manufacturers have obtained the orders as a result.

ROYAL AERO CLUB TRIBUTE TO LORD WAKEFIELD

FEW men have done more for aviation in such a genuine way as has Lord Wakefield. His benefactions have now been recognised for all time by the portrait which has been painted of him and hung in the Royal Aero Club.

This portrait was formally unveiled by Lord Londonderry at the Club on December 7. Preceding the unveiling there was a House Dinner in the Club, at which Lord Gorell, the chairman of the Club, presided. After the dinner Lord Gorell first read messages of regret from many members who were unable to attend, and then announced the receipt of a message from the Prince of Wales, in which Admiral Sir Lionel Halsey said:—"His Royal Highness desires me to say how pleased he is to hear that the members of the Royal Aero Club will have in their house a permanent memorial to Lord Wakefield, who has done so much to help aviation in this country."

LORD LONDONDERRY, when unveiling the portrait, which had been painted for the Club by Capt. Oswald Birley, recalled the occasion, as long ago as 1910, when Lord Wakefield had spoken at the Mansion House in favour of aviation. Ever since that time, he said, Lord Wakefield had done all he could do for aviation throughout the

Empire, and to him, therefore, we owed a debt of gratitude. He thought that the members were performing their proper duty in hanging on their walls this portrait of so great a citizen, and he thanked the Club for the honour they had done him in asking him to unveil it.

LORD WAKEFIELD, acknowledging the honour, was deeply touched, and especially so by the kind message from the Prince of Wales. He was always ready to help pioneers of aviation, he said, and to further the spirit of adventure. He was an optimist in these matters and proud to be an Englishman. He commented on the portrait by saying that the best and most satisfying thing about it was the fact that it pleased his wife. He was glad it was December 7 as that was his lucky number.

LORD GORELL, in thanking Lord Londonderry for unveiling the portrait, expressed the views of all members when he said that they were proud to have it upon their walls. He stressed the fact that from the beginning, Lord Londonderry had insisted that he felt greatly honoured by being asked to unveil the portrait, and in conclusion he announced that the next time Lord Londonderry came to the Club it would be as a member—an announcement which was received with acclamation.



THE JUNIOR AERO

FORMALLY constituted in March, 1931, the Junior Aero Club held its first Annual Dinner at the Ham Bone Club on December 6, 1932. The chairman was the President of the Club, Lt. Col. F. C. Shelmerdine, the Director of Civil Aviation, and the Guests of Honour were Messrs. C. W. A. Scott and A. C. M. Jackaman.

COL. SHELMERDINE pointed out in his speech as chairman that the Club was originally founded by the late Sir Henry Segrave together with Wing Com. R. Matrix and Mr. Rupert Preston, and since that time it had consistently followed its policy of entertaining those people who have made their name in aviation circles, but who, in many cases, have not been sufficiently recognised by other bodies.

Since its inception the Club has always attracted into its precincts all those who, as one might say, "carry most weight in civil aviation," and there can be few people of any importance who have not dined there at one time or another. On this occasion the Air Attachés, Lt. de Vaisseau P. A. Sala, of France, and Maj. Martin F. Scanlon, of the U.S.A., were both present. The former's visit was somewhat in the nature of a farewell, as he is leaving this country at the end of the year, and, while regretting his departure, we hope that he will carry with him many pleasant memories of his sojourn in our country.

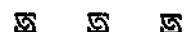
In introducing Mr. Scott, Col. Shelmerdine reminded those present of the magnificent flights made by their guest in April, 1931, when he broke the record for the trip to Australia, and also of his flight back again; much of the flight being made through the worst of the monsoon period. Their other guest, Mr. Jackaman, he pointed out, was one of the foremost private owners, and one who had probably gained more prizes than any other private owner at meetings not only in this country but also on the Continent. It was largely due to his enterprise, said Col. Shelmerdine, that the *Week-End Aérien* came into being and was so successful.

MR. SCOTT, in reply, after thanking the Chairman for his kind remarks, hoped that flights which, like his own, were somewhat spectacular, would later become quite com-



A New Royal Machine

HIS ROYAL HIGHNESS THE PRINCE OF WALES has again demonstrated his belief in aviation as the means of locomotion, and his desire to be up to date, by ordering a "Fox Moth" to take the place of his "Puss Moth." The new machine will be delivered to the Prince next week, and, although the change will mean a loss of over 10 m.p.h. cruising speed, the extra accommodation provided in the new machine will be ample compensation. His Royal Highness still owns two "Gipsy Moths" and will shortly take possession of the Vickers "Vista" which cruises at 120 m.p.h. These machines are all painted dark red and blue.



CLUB'S FIRST YEAR

monplace. He also hoped that the Australians would run some portion of the air mail line which is expected to be in operation to Australia before long.

MR. JACKAMAN said that, while he appreciated the honour done to him by asking him to be a guest at this dinner, he felt that Col. Shelmerdine had hardly been accurate when he attributed the idea of the *Week-end Aérien* to him. The truth of the matter was that, after a meeting at Zagreb last year, it was Col. Shelmerdine himself who had made the suggestion that some reciprocal event ought to be organised in this country, and throughout he had not only acted on the Committee, but helped the organisers in every way. Mr. Jackaman also mentioned many others, including in particular Mrs. Norman, who had worked so hard to make the meeting the astounding success it was. In this connection he told a delightful story of a Frenchman who was seen by his English flying marshal to alight in a field during the very foul weather on the way to Hooton. The marshal, who thereupon landed alongside, asked what the trouble was, and was told that the Frenchman found "this pub crawling" too much for him! . . . It was not until some time afterwards that the marshal found out that the phrase intended was "hedge hopping"!

Among the other speakers were Mr. Geoffrey Dorman, Mr. Mealing, Mr. Courtney and Mr. Eric Teesdale, the energetic secretary, to whom not only the Junior Aero Club, but also the Ham Bone Club, both owe so much.

Arranged around the walls of the Club were selections from the drawings of Messrs. Cavendish and Concord Morton.

These two gifted brothers show an unusual flair for artistic depiction of aircraft and parts thereof. They have spent much time at R.A.F. stations, on board aircraft carriers and at aerodromes, and have undoubtedly brought out many hitherto unsuspected beautiful aspects of the aircraft they have seen. Holding an exhibition of their work on this occasion was yet another proof of the unfailing originality to be found in the management of the Junior Aero Club.



Japan's Disarmament Suggestions

A FORECAST of the Japanese proposals for disarmament has been given by Vice-Admiral Osami Nagano to the Geneva correspondent of the *Daily Telegraph*. He said that these proposals would include the complete abolition of aircraft carriers, which the Japanese regard as offensive weapons, and the prohibition should apply to all landing decks on warships. The Admiral said:—"We do not propose to interfere with the present system, whereby certain ships carry a seaplane for scouting purposes. These are weapons of protection rather than of offence." Incidentally it is reported that the Japanese Naval Department has decided to dismantle its only airship.

Hinkler and his famous "Karohi"

WANDERLUST has seized "Bert" again. We ran him to earth in the hangars of Maj. Savage's Skywriting Company at Hendon, and found him, as usual, hard at work on "Karohi," the de Havilland "Puss Moth" on which he flew from New York to South America, across the South Atlantic, and from West Africa back to England. The machine still carries its Canadian registration letters CF-APK, and is again airworthy after a period in "cold storage." The great little pilot was busy installing a number of those ingenious devices which always distinguish Hinkler's machines from others. On being asked the reason for all this feverish activity, Hinkler favoured us with one of his winning, but sometimes rather enigmatic, smiles, and pointed out that Christmas was approaching, the weather was cold, flying in England was not all that it might be, what with one thing and another, and sunny skies were to be found elsewhere without going to 20,000 ft. or so. Altogether, there were plenty of reasons for going, and not very many for staying, and so "Karohi" was being groomed for another flight.

"There is no telling where we might go," Hinkler said. (He always refers to himself and his machine as "we," like that other great pilot Charles Lindbergh.) But the machine bore traces of careful preparations. The "Gipsy III" engine had been removed, and in its place one of the new "Gipsy Majors" had been installed. This should give Hinkler a somewhat higher cruising speed, and as his petrol tankage is large, he should be able to make some very long and fast "hops," in whichever direction he decides to go.

The petrol system remains identically what it was on the Atlantic flight, but Hinkler has added a very useful "flowmeter" of his own. On the right-hand side of the cabin, in the angle between the windscreen and the window, he has mounted a glass tube on which are painted two red lines. The lower end of this tube connects with the main petrol system via a cock. If it is desired to check the petrol consumption, Hinkler lets the glass tube run full up to the upper red line. He then times with a stop watch the time it takes for the petrol level in the tube to sink from the upper to the lower red line, and consulting his note book he sees that his consumption is so many gallons per hour.

On a long flight the question of engine lubrication becomes important, and Hinkler has installed a very ingenious scheme for supplying fresh oil to the tank to replace that used up. An inverted glass bottle with screw-on cap is clipped to the window frame opposite the flowmeter. The bottle connects via a tube with the oil tank low down on the port side of the machine. A length of steel tube inside the lower end of the flexible tube enables adjustment of length to be made. The end of the steel tube is, at the start, submerged a short distance below the oil level in the tank. As the bottle at the upper end is airtight, no oil runs down into the tank so long as the pipe is submerged. When, however, the oil level falls, and the end of the pipe is exposed, the oil can run down into the tank until the lower end is again submerged. In this way fresh oil is constantly being fed to the tank. When one bottle is empty, Hinkler unscrews it from its cap and substitutes a full bottle. Thus, instead of having a large quantity of oil in circulation, which is gradually deteriorating, the quality is maintained, and the engine is being as kindly treated near the end of a long flight as it was at the beginning.

Hinkler contemplates some rather long "hops," and night flying is not altogether excluded. To illuminate

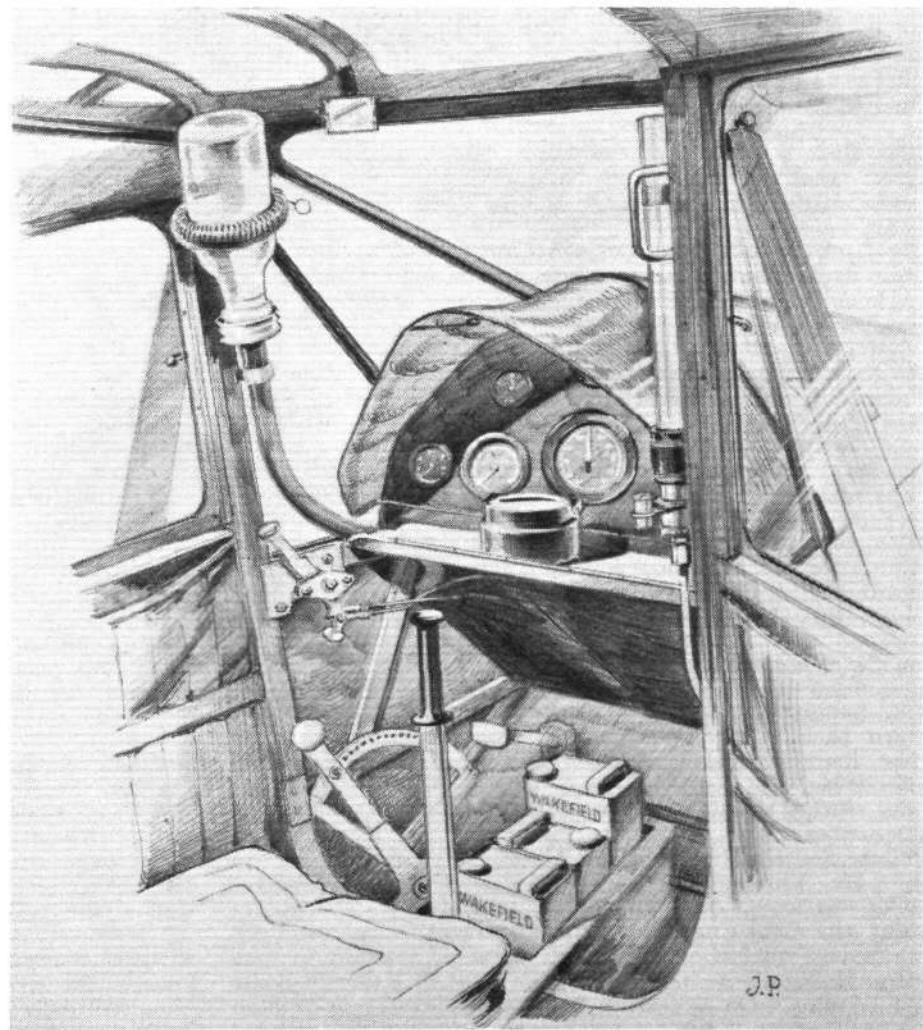
his instrument board without getting glare from the windscreen, he has rigged up a small flexible hood, inside which is fastened the socket for a small flash-lamp bulb. The bulb is blue and gives but a faint light, but it just suffices to make the instruments readable. The bulb itself is the switch of the circuit, a turn in one direction switching the current on, and a turn in the opposite direction switches it off.

The sketch on this page shows the oil bottle, petrol gauge and hood, as well as the oil cans from which the bottles are replenished.

On his Atlantic flight Hinkler carried a reserve of oil in gallon cans. These were placed on the floor, and during the flight two of them happened to lie in such a position that they just touched each other, thereby producing a very fair imitation of engine knock. "Bert" is not taking any chances of that happening again and giving him a *mauvais quart d'heure*. He has made up a frame of plywood into which the cans fit snugly, and to facilitate replenishing the bottles he is this time using half-gallon cans.

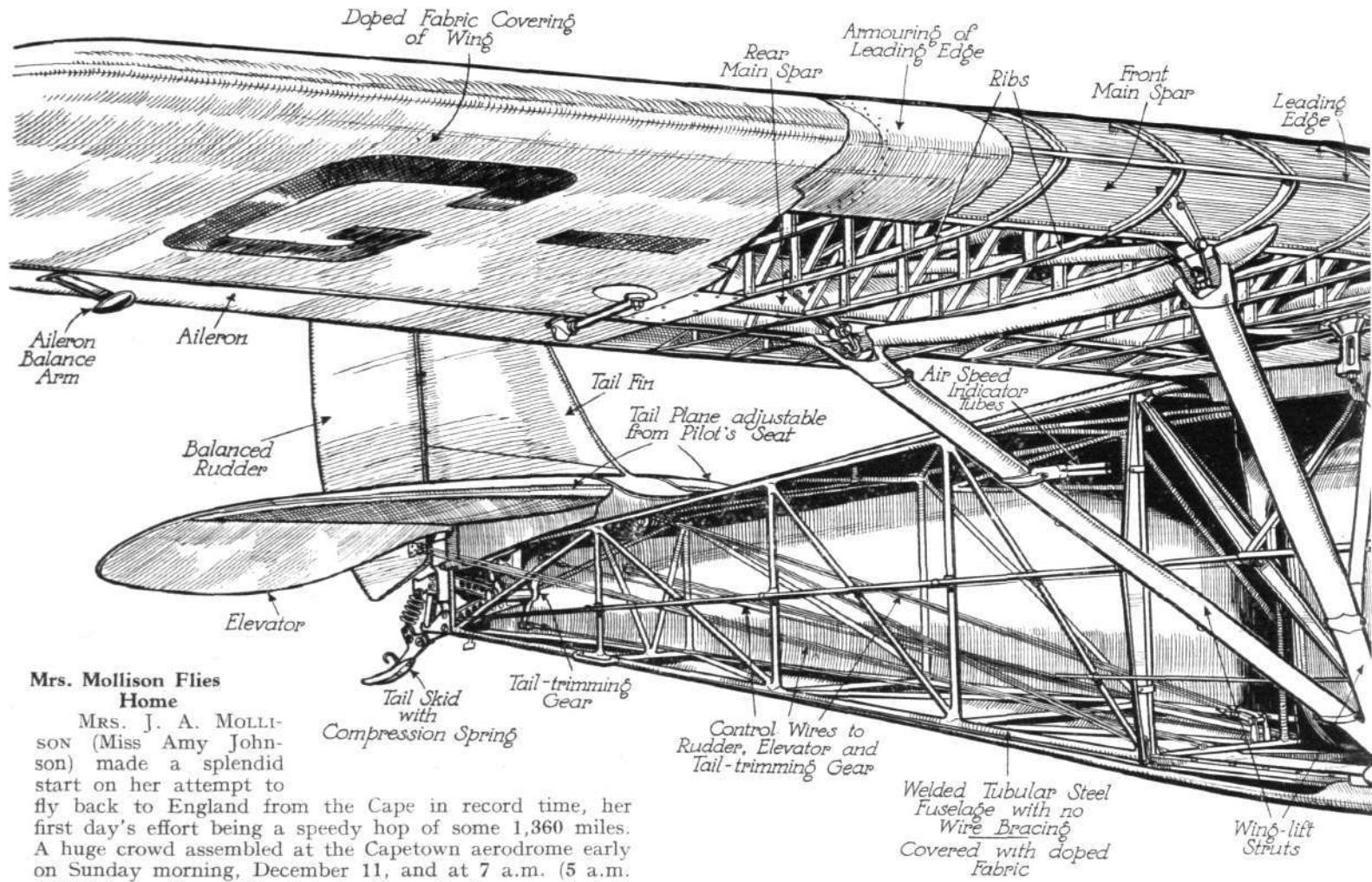
The rest of the equipment of the "Karohi" remains much as it was when Hinkler flew the machine across the South Atlantic.

Long experience in solo flying has taught "Bert" many little tricks, which the man who relies upon an engineer to maintain his machine and engine would never think of. This fact crops up in all sorts of little ways in "Karohi." For example, Hinkler has found that it is a good plan to carry a spare petrol filter. The filter on the "Gipsy Major" is one of the Tecalemit star-shaped type, and "Bert" carries a spare in a container, which is a standard container with all the excrescences knocked off. As the smooth casing would be difficult to hold firm in one hand while unscrewing the cap with a spanner, "Bert" has made a spanner out of sheet steel and mounted it on one of the engine bearers. Inserting the nut of the cap in this spanner, he can grip the container with both hands and easily unscrew the cap.



Airisms from the Four Winds

It would be difficult to show, in one drawing, a greater number of details than those which Mr. Max A. Millar has included in this part-sectioned view of Mrs. Mollison's "Puss Moth" "Desert Cloud." The drawing is reproduced by courtesy of "The Motor Cycle." The equipment differs considerably from that of Hinkler's machine (see p. 1191).



Mrs. Mollison Flies Home

MRS. J. A. MOLLISON (Miss Amy Johnson) made a splendid start on her attempt to fly back to England from the Cape in record time, her first day's effort being a speedy hop of some 1,360 miles. A huge crowd assembled at the Capetown aerodrome early on Sunday morning, December 11, and at 7 a.m. (5 a.m. G.M.T.) the *Desert Cloud* took off on the homeward dash to the accompaniment of enthusiastic cheering. Some four hours later Mrs. Mollison passed over Walvis Bay, flying fairly low at about 130 m.p.h. At 3.45 p.m. (G.M.T.) she arrived at Mossamedes, Portuguese West Africa, nearly 1,400 miles from the Cape, some hours ahead of her schedule. After five hours' rest and refuelling she set off again to fly non-stop to Duala, and passed over Benguella some two hours later. The aerodrome here was lit up for her, and numerous cars and people assembled to greet her as she passed over. About an hour later, however, they heard her engine again, and she circled overhead. The aerodrome was lit up again, and "Amy" made a perfect landing, in spite of the smallness of the aerodrome and the heavy load of fuel. She reported that she found thick fog ahead at Lobito, which forced her to turn back. After waiting about five hours she resumed her journey, and was reported over Loanda early on December 12. At the time of writing it is reported that she reached Duala, and took off again for Gao early on December 13.

Victor Smith's England-Cape Attempt

MR. VICTOR SMITH, the young South African airman, who was forced down in the Sahara during his attempt to beat the Cape-England record last month, had arranged to leave Croydon on December 13 on an attempt to beat Mrs. Mollison's recent flight to the Cape of 4 days 6 hours 54 minutes. On December 12 he took delivery at Hooton of his Comper "Swift" monoplane, on which he intended

to make the attempt, and set out for Croydon. Bad weather, head winds, and a shortage of petrol, however, forced him down near Luton.

An Australia-England Attempt

CAPT. HANS BERTRAM—the German airman who, it will be remembered, was lost some months ago in North-West Australia during a flight from Germany—set out from Port Darwin accompanied by Mr. G. U. Allen on December 12, on an attempt to fly to England within seven days. He was flying the same Junkers seaplane used on his previous flight. Sourabaya was reached in the evening, and a stowaway, discovered after they had left Bima, was handed over to the authorities. When taking off next day the machine failed to rise, and ran into a ditch and was damaged; the occupants, however, were uninjured.

A Flight to Australia Concluded

MR. J. R. HIBERT, the Canadian airman, who left Heston on October 12 in a D.H. "Moth," to fly to Australia, arrived at Port Darwin on December 6. A few days later, when landing near Cloncurry, he crashed in attempting to avoid a flock of sheep, but was unhurt.

Italian Girl Aviator Killed

SIGNORINA GABY ANGELINI, the 22-year-old Italian airwoman, crashed in Cyrenaica on December 6 and was killed. She was flying from Italy to India and had left Benghazi escorted by an Italian military aeroplane; it appears that the accident was due to a thick fog in

which she lost touch with her escort. It will be remembered that Signorina Angelini visited London last summer while making a tour of European capitals.

British Flight to Mount Everest

THE British flight to Mount Everest, which is being financed by Lady Houston, expects to leave England early in the New Year. The London headquarters, to which all communications should be addressed, are now at Grosvenor House, Park Lane.

"The Gallant Six Hundred"

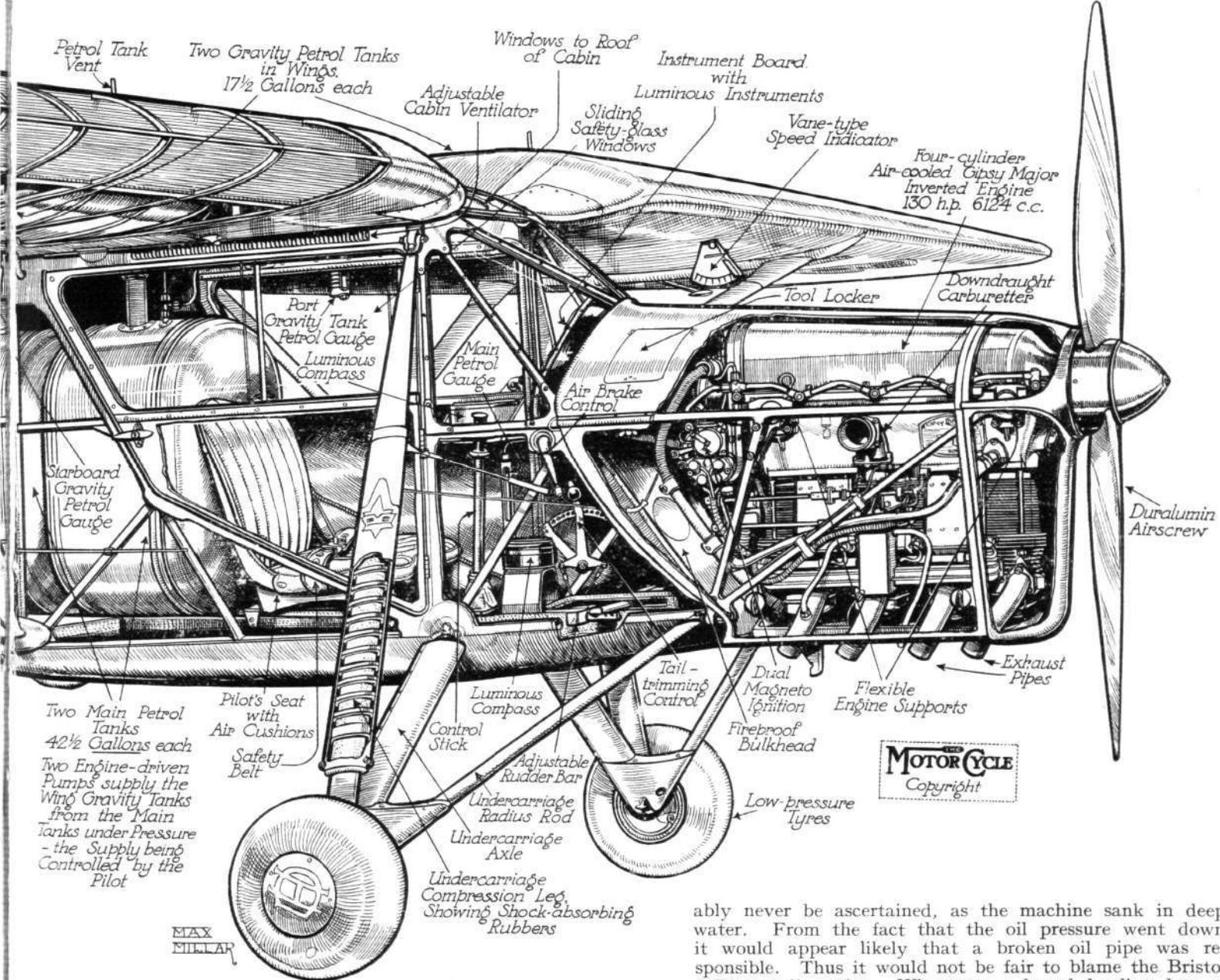
THE work and play of No. 600 (Bomber) Squadron of the Auxiliary Air Force during 1932 were admirably illustrated in a film shown at the Kensington Headquarters of No. 601 (Bomber) Squadron, A.A.F., on December 7. F/O. Ralph Hiscox, of the Accountant Branch, was responsible for producing this film, and deserves the very greatest credit for his work, both the construction of the film and the actual photography being remarkably good.

450 m.p.h.?

FROM Italy it is reported that Lt. Agello, flying a Macchi seaplane fitted with the "Fiat" double engine (see p. 1189) has attained a speed of 450 m.p.h. The flight was, presumably, in the nature of a test, and does not, of course, constitute a record, for which it is necessary to fly over the 5-km. course twice in each direction, the average speed being taken from the four. It is not surprising that one spurt at such high speed could be achieved. Probably Stainforth could have done as well in the Supermarine-Rolls S.6. To average 450 m.p.h. is, however, a very different story. At the same time it would be unwise to treat too lightly this Italian threat to the speed record, which stands at 407 m.p.h.

The Submarine "Hart"

THE exact nature of the trouble which compelled Mr. Sayer, one of the Hawker test pilots, to come down in the sea the other day while returning from France, will prob-



The scenes depicted deal chiefly with the A.A.F.'s part in the R.A.F. Display, and with the annual training, which this year was held at Tangmere. Wireless, photography, air gunnery, formation flying, and sports are all shown in an instructive and interesting manner, while "Nature in the raw" is a touch of genius. Special mention must be made of the sailing race for the Collett Cup, which was won by No. 601 Squadron. It is believed that the time for the race was something like twenty times longer than the time taken to make the Challenge Cup, but the fact will detract no whit from the keenness with which the Cup will be competed for next year. The audience at Wednesday's show included the A.O.C., Air Commodore W. F. MacNeece Foster, C.B.E., D.S.O., D.F.C., and Mrs. Foster.

ably never be ascertained, as the machine sank in deep water. From the fact that the oil pressure went down it would appear likely that a broken oil pipe was responsible. Thus it would not be fair to blame the Bristol "Pegasus" engine. Whenever a forced landing has to be made, it is nearly always put down vaguely to "engine trouble," whereas, in a great many cases, the fault does not lie with the engine itself.

Air Orient Agents in United Kingdom

THE Messageries Maritimes, 72, Fenchurch Street, London, have been appointed to represent the French Air Orient in the United Kingdom. That company operates a regular air route between Marseilles and Beyrouth, calling at Naples and Athens, also between Damascus and Baghdad and Baghdad and Saigon via Karachi and Calcutta, etc. M. Nogues, Director of the company, has recently returned from a business visit to the Far East, where, he states, he has signed agreements with various Chinese authorities for the extension of the Marseilles-Saigon (Indo-China) service to Hanoi, Canton and Hong Kong.

The Aircraft Owner Always Pays

Being further personal views of Mr. Alan Goodfellow, whose first article appeared on page 1146 of "Flight" for Dec. 1

In the previous part of this article reference was made to the compulsory Third Party Liability imposed upon aircraft owners by the Convention of 1919. In fairness to the framers of the Convention it should, however, be made clear that the Convention does not of itself impose this liability, nor have its provisions any legal effect, except in such countries as have ratified the Convention and have passed laws of their own to give effect to its terms. What the Convention does do is to establish as between all countries who are parties to it the doctrine of the sovereignty of the air. In other words, each contracting state has sovereignty throughout the air over its own territory (including territorial waters and Colonial possessions) and has therefore the right to fix by legislation the terms upon which aircraft may use such air space and the liabilities which shall attach to the owners or personnel of such aircraft.

In conformity with this principle, which abrogates the older (alleged) principle that a man owns all the air space above his own land, nearly all the contracting states have passed laws in which some form of what may be termed compulsory third-party liability is imposed upon aircraft operators. The conditions of liability vary from state to state, but the principle is essentially the same in the vast majority of civilised countries where aircraft are operated.

An International Liability Rule

The new Convention under consideration differs from the old one in that, *as regards interstate flights*, it proposes to lay down certain definite international rules of liability which shall apply to all states ratifying the Convention. Whether or not the ratifying states will at the same time introduce legislation applying the terms of the Convention to flights within their own respective boundaries remains to be seen, but they will presumably be under no obligation to do so.

There are good reasons for doubting whether such application is desirable. If, as has been generally assumed, the existing liability is in fact an absolute one (as distinct from a mere presumptive liability which can be rebutted by evidence to the effect that the owner or operator, as the case may be, was not guilty of negligence), then, as previously mentioned, the logical, or quasi-logical grounds in support of applying the principle and extending it are very limited. It may be applied as a compensation to the land-owner for the taking away of his alleged exclusive rights in the air space above his land. Alternatively, it may be applied merely as an extension of the rule in *Fletcher v. Rylands*, which, in effect, throws upon the owner or operator of anything calculated to cause third-party damage if it gets out of control—(e.g., a pet tiger)—the onus of keeping it under control. This last point may be dismissed from consideration, since the Courts have definitely indicated an unwillingness to extend the rule and there is no more justification for applying it to an aircraft than to a motor car.

Attacking Old Principles

The first ground, though it can be supported, has also been strongly attacked just lately. M. Richer, in an article in *Droit Aérien*, has gone far to show that the old doctrine of private ownership of air space, which was generally looked upon as a principle of Roman law, is really of doubtful existence as such. In our own Courts there were a number of cases decided during the nineteenth century which proved that the doctrine was not considered as conferring an absolute right, while now, in the United States Circuit Court of Appeals, it has just been held that in so far as the doctrine is of any force it must be considered adaptable to the needs of modern progress. In the case of *Swetland and Others v. Curtis Airports Corporation and Others* it was held that "*The owner of land has no right in the upper stratum of air overlying his land which he may not reasonably expect to occupy, except to prevent the use of it by others to the extent of an unreasonable interference with his complete enjoyment of the surface.*" Although American decisions are not, of course, binding in this country, the principles of law in both countries are similar. If, therefore, the view is

accepted that the maxim referred to is either of no force, or, alternatively, is to be adapted to the needs of modern conditions, then all legal grounds for the infliction of compulsory third-party liability upon aircraft owners of operators would be swept away.

It may be that there are some grounds for insisting upon compulsory insurance of liability up to a reasonable limit and with due regard to the respective rights both of users of the ground and of the air. Unfortunately, experience has shown that the effect of compulsory insurance is to increase to a tremendous extent the number of cases which come before our already overcrowded Law Courts, but there seems to be no way of avoiding this difficulty.

Equality for Air Transport

Whether or not compulsory insurance is to be introduced, however, it is high time that users of the air claim the right to be treated, not as a species of highly-explosive bomb, but on a similar basis to any other recognised form of transport. For reasons previously referred to it may be necessary to accept for the moment a presumption of negligence in the case of damage caused by aircraft, provided that this presumption may be negatived by evidence. It may even be that this is the true legal construction of our existing Air Navigation Act, but if this is the intention then the wording should be amended to make the fact clear.

In the U.S.A., though one may not approve of everything they do in the name of progress, the views of the legislature and the Courts are at any rate becoming air-minded to a degree which is certainly not the case in Europe. Indeed, they are even outstripping the views of the man in the street if one may judge by the extremely interesting case of *Herrick and Olsen v. Curtiss*, where the judge, in his summing up to the jury upon the question of "ordinary care by a reasonable man," found it necessary to say "That does not mean that you should go to your jury room and say, well, I think a reasonable man would stay on the ground"!

The sooner we can free ourselves from the trammels of artificial and unnatural restrictions, which at present hedge about our civil aviation on every side, the sooner it will develop along the lines which nature (or the devil as the case may be, according to one's viewpoint) intends it to. In other words, let us ban it altogether and make it illegal to fly, or else let us develop it in accordance with common sense and common law.

It is a truism that there is no gain without sacrifice. Motor cars have involved a loss of peace and quietness, an increased risk of personal injury, or of injury to property and trespass, as, for instance, by the skidding of a bus through one's garden wall. In the same way aeroplanes, while adding to the speed of transport, have involved similar sacrifices on the part of the general public, many of whom have no wish to use an aeroplane—just as many people never wished to use a motor car, or a railway train, or a steamer, or a stage coach, or a Sedan chair for that matter!

Encouraging Development

Surely the fundamental principle is that if States accept a new form of transport as lawful they should encourage, rather than restrict, its development, imposing only such legal fetters as are necessary to ensure that he who develops and operates it shall (a) be responsible for any damage to others *attributable to his negligence*, and (b) where there is special likelihood of such damage, be in a position to satisfy such responsibility *within the limits of reasonable expectation*?

In conclusion, international agreements are admittedly necessary to the progress of civil aviation—not to mention civilisation!). An agreement adopting the basic principles set out above would, it is claimed, be fair to all parties concerned. For that very reason, alas! it will probably not be agreed to; at any rate for so long as our international comings and goings by air continue to be controlled by those who know just enough about aviation to consider it as an invention of the devil, but who lack the force, either of will or of power, to excommunicate it!



Air Survey

By LIEUT. J. S. A. SALT, R.E.

A Lecture delivered before the Royal Aeronautical Society on Thursday, December 8, 1932. (Abridged)

IN England, where accurate maps are available for almost any purpose, we are apt to take their existence for granted and to forget the foresight, time and labour necessary for their preparation and constant revision. For engineering and administration there are the sheets at scales of 6 in. and 25 in. to one mile; the soldier, and in particular the gunner, prefers a map on a scale of about $2\frac{1}{2}$ in. to one mile; walkers and cyclists, the 1 in. to the mile series; the motorist uses a $\frac{1}{4}$ -in. map, of which series a special edition is produced for the airman; and finally the map of England at 10 miles to the in. is available for those who do their long-distance journeys by air. All these benefits are the result of the wisdom of those who initiated the Ordnance Survey of Great Britain.

The increasing importance of air communications in the British Empire, leads to a consideration of the type of map best suited to purposes of navigation and identification of places. A map on a scale of 1/1,000,000 (or about 16 miles to the inch) would satisfy the demands of the navigator, while for identification purposes a scale of 1/250,000 (or $\frac{1}{4}$ in. to the mile) is a suitable compromise with other normal requirements. A series of sheets on these two scales would adequately and reasonably fulfil all demands that are likely to be made, and should be the aim and object of any scheme of mapping for flying purposes.

Now, by far the greater part of the Empire is virtually unsurveyed, and the existing maps are rapidly becoming out of date. The methods exist whereby our vital survey needs can be met and on which an efficient organisation can be evolved. We shall examine below the broad basis of such a technique.

Photography as an Aid to Survey

Suppose that from some station commanding a good field of view a photograph is taken with the axis of the camera horizontal. Then from a knowledge of the calibration data of the camera we may construct on the photograph a graticule system depicting angles subtended at the perspective centre, in the same way that parallels of latitude and meridians of longitude on the surface of the earth depict angles subtended at its centre.

In this case azimuths will be represented by vertical straight lines, and elevations by hyperbolic curves convex to the horizontal. With a knowledge therefore, of the orientation of the camera axis at exposure, we have a pictorial record of angles in space to all objects in the field of view, such as might have been obtained by an observer with a theodolite. Suppose, now, that the exact position of the camera station is known and that another photograph is taken from a second known station covering much the same field of view from a different aspect. From the data provided by the two photographs the positions in space of all points in the common field of view can be determined by means of two-ray intersections. Various methods of applying this principle have been evolved, ranging from actual determination of angles, followed by computation, to completely automatic plotting.

The photography of an area from two different points of view opens up the possibility of stereoscopy. In ordinary life, by having two eyes separated by a short eye-base (about $2\frac{1}{2}$ in.) we obtain two slightly different plane views of the same object space, from which our brains interpret a picture in the solid. This faculty is seldom consciously called into play, since there are usually other factors enabling us to estimate relative distances, but it is interesting to note that in the animal world it is possessed only by beasts of prey, the eyes of herbivorous animals being so situated that they view the world as a flat panorama. Where the base separating the two viewpoints is large, then by observing the two photographs in a stereoscope we may obtain the same view of the landscape as would be obtained by a giant possessing the large eye-base. The country is seen in relief as a small-scale plastic model. This property is made use of in automatic plotting machines.

The application of this method is restricted by the limitation of the field of view. Though of great value in hilly country, it is of little value in flat or gently undulating regions. The advent of flying offered freedom from this restriction, by virtue of the almost unlimited field of view available. Since then, the application of air photography to every variety of survey has been closely studied, and methods are now available to suit every kind of need.

When two overlapping photographs are taken from known ground stations and at measured

orientations, it is a simple matter to place them in a plotting machine so that they are in the same angular relationship one with the other as they were at exposure. By using an ocular system equivalent to placing the eyes in the two positions originally occupied by the lens, so that the left eye observes the left-hand photograph and *vice versa*, all angular relationships between the camera stations and the object space are preserved. The plastic model is, therefore, true in shape, but at a different scale. In the case of air photographs, however, the exact positions of the air stations are not known, neither are the orientations of the photographs. Some other procedure must, therefore, be devised.

Now it can be proved that if two photographs taken from air stations S_1 and S_2 , and covering, in part, a common area of ground, can be adjusted so that any five pairs of corresponding points lie in the same basal planes, then all other pairs will lie similarly in their basal planes, and the photographs are correctly oriented. (Fourcade. "Transactions of Royal Society of South Africa." Vol. XIV. Part I (1926).)

Plotting Machines

A plotting machine is an instrument for reconstructing from a pair of overlapping photographs, a spacial model on which the detail and contours may be traced out and plotted on a drawing board automatically. In order to define the point in space observed, a floating mark is used; that is to say, a conventional mark whose apparent position in space may be altered by means of certain mechanisms connected with the drawing pencil. By adjusting the mark to lie coincident with the ground at any point, the position and height of that point are automatically recorded.

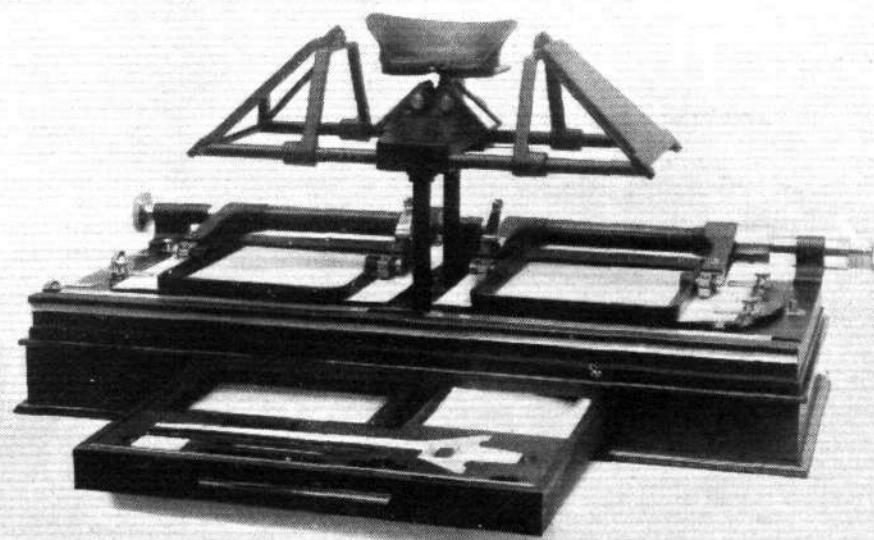
There are many types of plotting machine, differing widely in their optics and mechanisms, but the general principles of their operation remain the same and entail three stages:—(1) Internal orientation; (2) external orientation; (3) setting of scale and orientation of relief model.

(1) Every plotting machine consists essentially of two goniometers, which are dimensional replicas of the camera with which the photographs were taken, and are fitted with similar lenses. Internal orientation consists of the setting of the pair of photographs in their goniometers so that they occupy the same relationship to the rear nodal point of the lens as they did at exposure, and will depend upon the calibration of the particular camera used. Angular relationships between points on the plates and their perspective centres are now true.

(2) External orientation, or the relative orientation of the pair of goniometers one with the other, consists of the adjustment into their respective basal planes of five pairs of corresponding points. Want of correspondence can be observed by means of the floating mark, and eliminated by means of setting movements. Internal orientation is not changed, and the reconstruction of the stereoscopic model is now complete as regards shape, though unknown in scale and orientation as a whole.

(3) The scale and orientation of the relief model may be obtained by making the plotted positions and heights of three points agree with the data obtained from ground survey. Checks may be made on any number of other points available. Detail is then drawn by operating the mechanism so that the floating mark follows the features of the country. By clamping one movement the floating mark may be forced to move in a definite horizontal plane; its path when in apparent contact with the ground will then trace out a contour.

The efficacy of a plotting machine will depend upon its ability to carry out the above three operations in a direct manner and in the shortest possible time. Most instruments, for instance, cannot carry out operation (3) without upsetting the previous adjustments of operation (2), arriving at the correct



The Barr and Stroud Topographical Stereoscope Type Z.D.10.
(Crown Copyright Reserved)

result either by means of computation or by successive approximation. The only instrument built on fundamentally correct design is the Fourcade Stereogoniometer (Barr and Stroud).

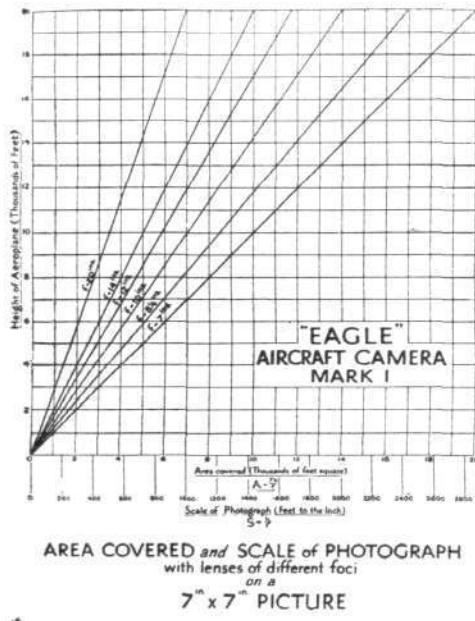
Simplifications in Case of Vertical Photography

Consider the case of a pair of overlapping photographs taken as far as possible at the same height and with the axis of the camera vertical. When set in a plotting machine, therefore, the two photographs will lie in very nearly the same plane. Consider, therefore, a simplified form of stereoscope in which the photograph holders are not goniometers, but flat turntables. The photographs are placed on the turntables, with their principal points at the centres of rotation, and are oriented in their own plane. When viewed stereoscopically they will present a relief model, though slightly distorted, since angular relationships are no longer true. Provided, however, that the tilts on the photographs are small, and that we possess a series of spot heights obtained by a ground survey covering the common overlap, we may draw contours on this relief model which are sufficiently accurate for topographic purposes.

The instrument necessary is small, of simple construction, and correspondingly cheap. The floating mark consists in this case of a grid which can be adjusted so as to appear to float horizontally in space at any desired height. The contours are drawn on the photographs themselves, and are then similar to nature in detail. We require now some method of plotting detail.

A vertical photograph of flat country would (within the limitations of lens distortion) be a true plan of the ground. If a photograph is tilted, the result is no longer a true plan, since the scale will be different in different parts of the picture, being, in fact, smaller on that side of the negative tilted towards the ground, and *vice versa*. In practice, however, the ground is seldom absolutely flat, and there are further distortions due to variations in ground height. On a vertical photograph, for instance, every contour is photographed at a different scale, the tops of hills being at a larger scale than the bottoms of valleys. It is found, however, that provided tilts can be kept to within two degrees of the vertical, and ground heights do not vary by more than 10 per cent. of the altitude of the aircraft, we may take the principal point itself as being angle true. This, being a function of the camera only, is available from the calibration data.

Suppose, now, that a strip of nearly vertical photographs are taken at approximately the same height and in such a way that each photograph overlaps the next by about 60 per cent. There will thus be a small area, in width 20 per cent. of the width of a photograph, common to every three successive photographs. We now have sufficient data to build up a graphical triangulation, dependent on angular relationships only, which will determine the true relative positions of photographs along the strip. This is carried out on celluloid and is known as a minor control plot. It will be true to shape, and at some definite but unknown scale. Any point of detail may now be fixed by a two-ray—or in some cases a three-ray—intersection from the principal points of the photographs on which its image lies. If the



positions of any two such points have been determined by ground survey, then the scale and orientation of the minor control plot are fixed.

When it is required to survey a large area, strips are flown parallel to each other and with a lateral overlap of about 25 per cent. between adjacent strips. In this case a minor control plot is constructed for each strip, and these will all be at different scales. The next stage, therefore, is to bring them all to some common scale. A grid, known as a master grid, is constructed to represent 1,000-m. squares (say) on some definite scale approximating to the scale of the photographs. On this are plotted all the points whose positions are available from ground survey and which can be identified on the photographs and intersected on the minor control plots. A control equivalent to a second-order triangulation will be sufficient. All strips are then tied in to this framework of ground control, suitable points being chosen in the common lateral overlaps to ensure exact agreement between adjacent strips. The result is a series of principal point traverses plotted to the same scale and in their correct relative positions on the master grid.

Finally, a sheet of celluloid of convenient size is placed over the master grid and the principal point traverses are traced off. On this sheet the detail is plotted from the photographs by placing them under the corresponding principal points and in the correct orientation, and carrying out a series of intersections and interpolations. All detail drawn in this way will be plottably accurate. Contours are transferred from the photographs similarly.

All mapping material thus obtained must be fair drawn according to the

conventional signs and symbols adopted for the map. Plates are then prepared for as many colours as are required, and the map is reproduced and printed in the ordinary way.

The Air Photographic Problem

With a view to carrying out the above technique we may state the demands of the surveyor as follows:

(1) Photographs should be taken in strips, flying a straight course at a constant height, usually 15,000 ft. above ground level.

(2) The fore and aft overlap between photographs along a strip should be 60 per cent.

(3) The lateral overlap between adjacent strips should be 25 per cent.

(4) The tilt of the camera at exposure should be kept as small as possible, and should not exceed 2 deg.

The characteristics desirable in an aircraft for survey photographic work may be summarised as follows:

(1) Endurance.—An endurance of 6-8 hr. is desirable.

(2) Comfort.—To ensure accuracy in navigation and camera operation under extreme cold, comfort is essential.

(3) Stability.—The greater the aerodynamic stability, the better the quality of flying.

(4) View.—The pilot must have a good view ahead and to both sides, and the instruments used for maintaining the correct course, height and level should all be grouped near to his normal line of sight.

(5) Speed and climbing.—Speed is useful in climbing to the required height and when photographing some way from the aerodrome. For actual photography, however, a steady cruising speed of about 100 m.p.h. is probably the most suitable. When photographing hilly country, a machine with high performance is required to reach the necessary height with full photographic load.

(6) Multi-engine.—For large surveys, and particularly in country unfriendly to a forced landing, a triple-engined machine, capable of maintaining level flight on any two engines, has the advantage of greater security.

To photograph a strip it is usually necessary either to fly between two observed points, maintaining a straight and level course, or to fly over a given point, maintaining thereafter a given compass course. Both of these methods entail the determination, either directly or indirectly, of the speed and direction of the wind. This, added vectorially to the air speed, determines the ground speed, the difference in direction between the two latter being the angle of drift. The duties of the photographer are:

(1) To determine the wind speed and direction and direct the pilot on to the correct course.

(2) To turn the camera through the angle of drift so that the photographs are not "crabbed."

(3) To trim the camera level when steady flight at the required height has been achieved.

(4) To set the time interval between exposures necessary to produce the required fore and aft overlap.

The time taken in carrying out the above operations will depend on the methods and instruments used and on the skill of the photographer and pilot, but the interval between taking off and starting photography, even close to the aerodrome, will seldom be less than 50 minutes. Sound meteorological information is therefore essential, particularly in cases where changes of weather are rapid.

As an aid to straight and level flying, gyroscopic control has been introduced. The results are remarkable. Tilts are reduced to less than half a degree, and strips are practically straight. The effect of this is greatly to increase the validity of the assumptions made in the simplified method of plotting, and to extend its application to conditions of very scanty ground control where a solution would otherwise hardly be possible. The gyroscopic control of aircraft for air survey purposes is therefore of the highest importance, and no survey of any large area should in future be undertaken without it.

Air Survey Procedure

We are now in a position to outline a suitable procedure for embodying the above technique, and to estimate some of the quantities involved. The process may be sharply subdivided into three sections:—(1) Air photography; (2) Ground survey; (3) Drawing office work.

It must be emphasised, however, that efficiency in any one section can only be achieved along with an accurate and sympathetic understanding of the work of the others.

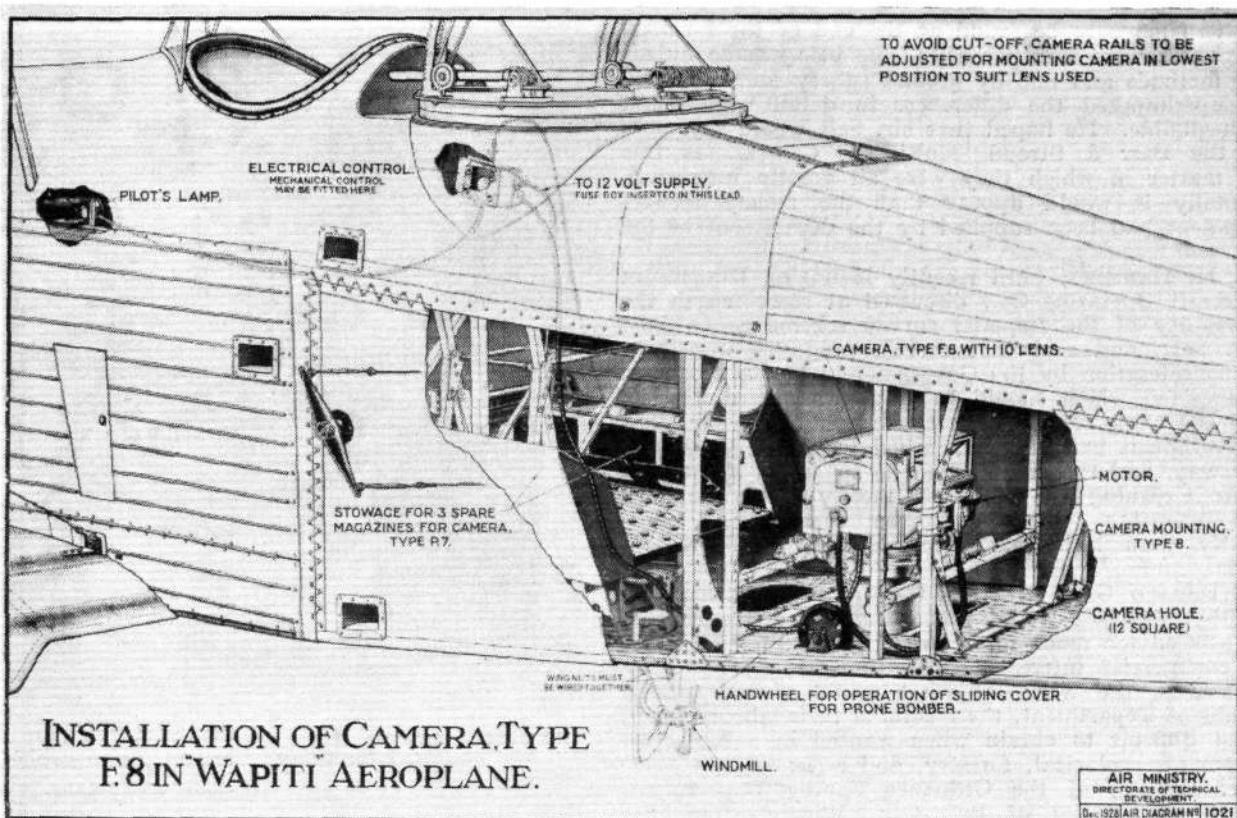
(1) Air Photography

The procedure has been outlined above. The camera used in the R.A.F. at the moment is the Automatic Film Camera F. 8, fitted with an 8½ in. lens and taking a photograph 7 in. square. When flying at 15,000 ft. the area covered by a single photograph is, therefore, about 5½ square miles. Maintaining the normal overlaps, an estimate of about two square miles per photograph will give the number of photographs required to cover any given area. With suitable weather, the rate of photography when once started may be taken as about 200 square miles per hour.

To navigate the flights in the most efficient manner, a network of strips will first be flown to cover the area with a skeleton framework. This is plotted first of all, and on it are laid down the centre lines of the various strip flights required. The photographs crossed by these flight lines are used later by the pilot to check his course for the filling-in strips.

(2) Ground Survey

The ground survey party should, where possible, carry out a second order triangulation, or equivalent traverse work, and fix a number of spot-heights. They are recorded and marked on the photographs themselves, which are mounted into albums for use in the field.



The Westland "Wapiti" has widely been used by the R.A.F. for photographic duties in many parts of the Empire. (Crown Copyright Reserved)

(3) Drawing Office Work

Each draughtsman will require a topographical stereoscope (Barr and Stroud, see illustration). A problem of vital importance is the correct interpretation of the detail on the photographs, the collection of all kinds of information usefully shown on a map and the marking of names. All data of this kind should be collected by the ground party and recorded in the photograph album. To mark the names on the map, a special instrument, the photonymograph (Barr and Stroud), has been devised, by means of which the names are photographed in any desired type. This is many times faster than hand lettering of similar quality.

Future Developments

For many purposes of administration and for flying, a map on a scale not larger than 1/250,000 is required. In the normal way, however, we are forced to take our photographs at more than ten times this scale, and the cost of flying per map sheet becomes prohibitive. A reduction of focal length merely reduces the scale of the photograph without reducing the flying. Since the limit in this respect has now been reached for a single lens, the solution is a multi-lens camera producing a photograph equivalent to having been taken with a wide-angled single lens. Messrs. Barr & Stroud are now undertaking the construction of a nine-lens camera of this kind. Flying at 15,000 ft. above the ground, it will produce a photograph at a scale of 1/60,000 covering an area of about 100 square miles. Flying costs are therefore reduced to one-quarter, and only one-sixteenth of the number of photographs have to be handled and plotted. It is expected that by means of this camera, large areas of 1/250,000 maps may be produced which would not otherwise be possible.

Imperial Survey Organisation

Having briefly reviewed the technique of air survey, we can appreciate the contribution it offers to survey problems in the British Empire. The question arises as to what form of administration can best carry out the aims of a given policy.

Experience has shown that a private company operating by contract is not a suitable organisation, and that its deficiencies are only increased by a multiplicity of such companies. The difficulty lies not so much in organisation of the company itself as in the intermittence of demand. Allowance must be made for preserving the personnel and equipment over the stagnant periods and costs are therefore higher than they need be.

The only sound organisation would seem to be one on Imperial lines. The drawing and map reproduction department should be centralised, where the most skilled draughtsmen and most up-to-date equipment would always be available. The photography necessary to keep such an establishment fully employed could be carried out by a few specially-constructed aircraft which could be flown to different parts of the Empire to make the fullest use of favourable weather conditions. The ground survey could be carried out by permanently enlisted personnel whose work would alternate between

survey operations in the field and supervision at the central office. In view of the enthusiasm of the surveyor for his work, any organisation which offered him a life interest in survey and removed the fear of unemployment would be highly efficient.

The cost of survey by such an organisation is difficult to estimate, since no data exist into which various irrelevant but inseparable factors do not enter. There is no doubt, though, that the cost would be comparable to that of ordinary ground survey, probably slightly cheaper, and that when completed considerably more would have been achieved for the money. For instance, the photographs would form a basis for geological, ecological, forestry surveys, etc., and a series of maps for different development purposes could all be produced at the same time. Experience has shown that the value of air photographs in this connection is unique, since they provide accurate information which often could not be obtained in any other way.

Thus far is clear, and it seems almost incredible that efforts to initiate such a scheme should not be actively sponsored. The conventional excuse is that "financial conditions do not permit"—which leads to an examination of the conditions of finance. It is obvious that if there is a human need, and there are at the same time the personnel, technique, and potential equipment necessary to supply that need, there exists a state of real credit. The function of the financial system is then to set on foot the financial credit necessary to bring vitality to this real credit. If it fails to do so, it fails to carry out the only function for which it may rightly be said to exist, and should be replaced by some system less definitely anti-social. The failure of the present system is by no means due to any difficulty in devising a better one, but lies in the vested interests of its upholders. It is useless, therefore, to devise schemes for Imperial well-being without at the same time undertaking a study of the root stimuli of our existing economic system. When British people jump to the fact that real wealth is a function of the brains and energy of men and women, and has little or nothing to do with the fictitious figures so dear to the hearts of financiers, then, and only then, shall we be enabled to carry on with schemes of practical development in the Empire, and in that distant millennium it is quite certain that air survey will play its part.

Discussion

MR. H. E. WIMPERIS (Director of Scientific Research) was in the chair for the lecture, and in opening the discussion he recalled a very interesting coloured map which was to be seen in the office of the Air Survey Committee at the War Office. This showed that only a very small portion of the world was at present fully surveyed. He hoped that this map would gradually become more highly coloured as the survey work progressed. Referring also to Mr. Hotine, who preceded Mr. Salt, he drew attention

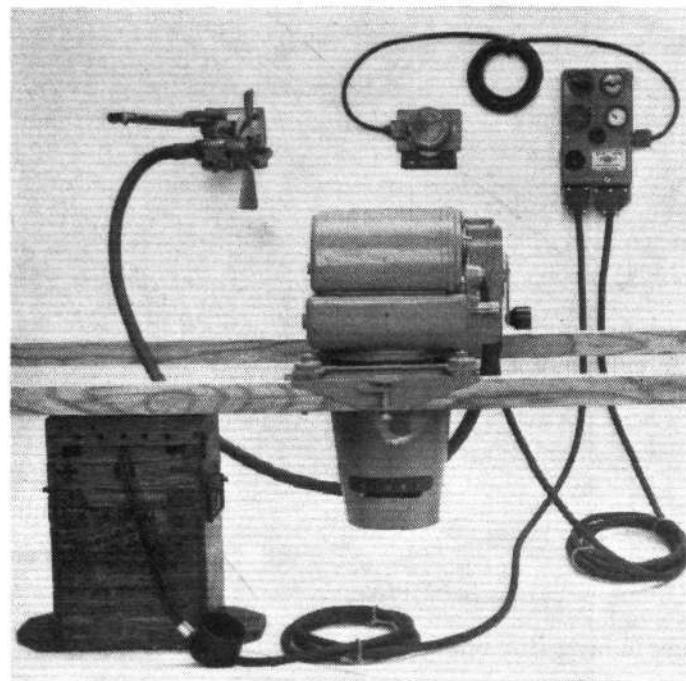
to the two maps to be found at the end of the former's book. These were transparencies, one being made by air survey methods and one by ground survey methods, and when superimposed the differences in detail were found to be negligible. He hoped that Mr. Salt would say more about the Barr & Stroud Multi-Lens Camera, as this was a matter in which they were all greatly interested. Incidentally it would appear that the money for its development had been supplied by the department of the D.S.R.

MAJ. H. HEMMING, until recently Managing Director of the Aircraft Operating Co., discussed at some length the inadvisability of the Imperial survey scheme as outlined by Mr. Salt, and said that certain proposals were now under consideration by the Government wherein a scheme was suggested which should build up an organisation to control the work of surveying the Empire. He said that the Government had not been asked for financial support in any way, and the organisation he suggested should not be a profit earning one. It would merely enable the work of the operating companies to be carried out more efficiently than hitherto, independently of Government control.

MR. DONALD GILL felt that the Imperial scheme suggested by Mr. Salt would lead to the resulting surveys being utilised too much for mapping and insufficiently for other commercial interests. He thought that if these surveys were the work of what would virtually be a Government Department, the results of their labours would be most difficult to obtain when wanted in a hurry for development, geological, forestry, and other interests.

CAPT. WILLIS, of the Ordnance Survey Department, offered the apologies of Brig.-Gen. Winterbottom, the Director of the Department, for his inability to be present. Gen. Winterbottom, in a communication which was read out by Capt. Willis, thought that Mr. Salt's paper was admirable, including the suggested Imperial organisation. He would like to suggest the addition of a permanent, African ground staff to it.

MR. SALT, replying to the discussion, regretted that he had not previously mentioned the Eagle camera which was shown in the Lecture Room. This was of the latest model, comparable to the F.24 as used by the R.A.F., and was fitted with the Williamson Louvre shutter. With regard to the Barr & Stroud Multi-Lens Camera, he did not feel that the time was yet ripe to discuss further details of this, as they had, as yet, no knowledge of what



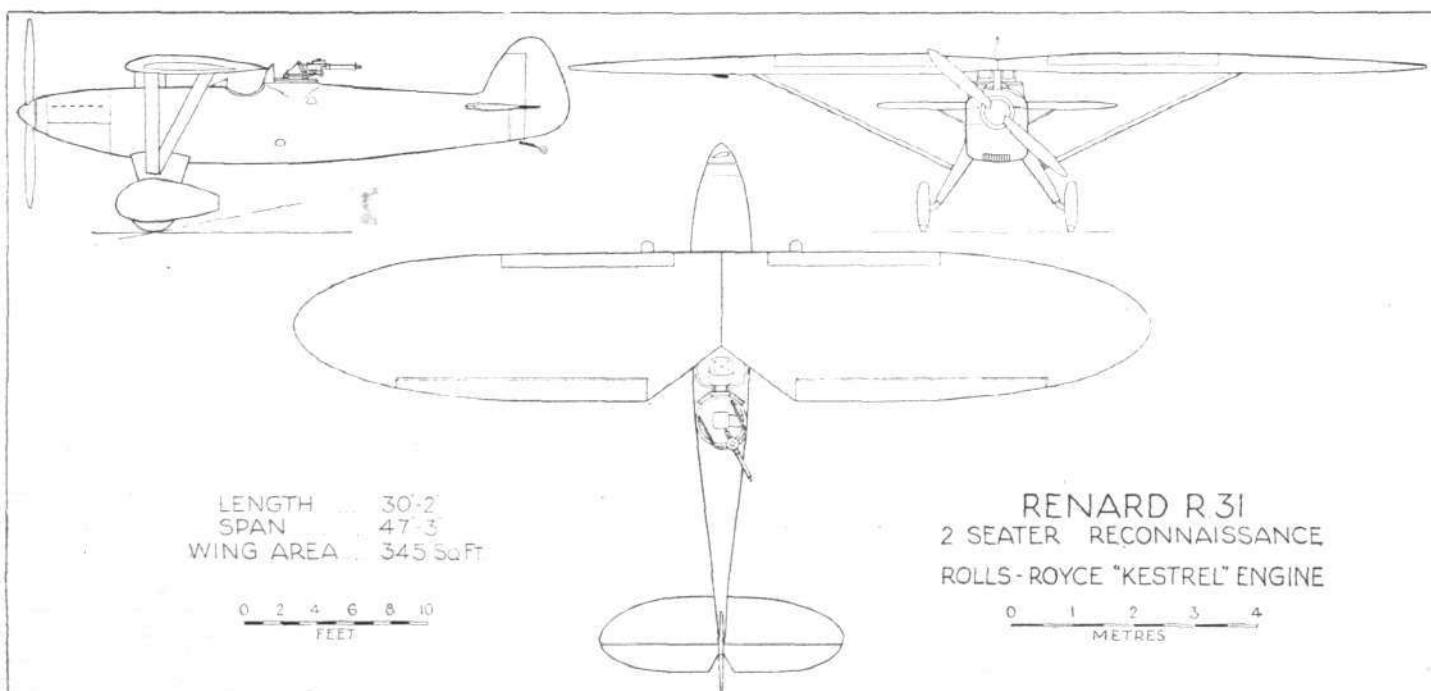
The latest camera used in the R.A.F. Type F.24, as mounted for taking vertical photographs.

(Crown Copyright Reserved)

would be gained from the distant oblique rays utilised by this apparatus. In reply to Mr. Gill, he did not think that a properly run Government Department was such an inefficient organisation as perhaps many people thought. In defence of this contention, he pointed to Canada, which, he said, has probably the most efficient air survey department in the world. Their library, as a result of some ten years' work, contains 560,000 prints, and this library is open to anyone who wishes to gain information on any part of that country. He would like also, he said, to mention the well-known firm of Ross, as it was very largely due to them and their wonderful lens, that so much advance had been made within recent years in the science of aerial photography for survey purposes.



BRITISH ENGINES IN BELGIUM



ROLLS-ROYCE ENGINE IN BELGIAN FIGHTER: Designed and built by Constructions Aeronautiques G. Renard, of Brussels, the R.31 is intended for long-distance reconnaissance. It carries wireless and photographic apparatus in addition to three machine guns. The construction is entirely in metal with the exception of the covering. A maximum speed of 200 m.p.h. is claimed, while the climb to 6,000 m. (19,700 ft.) occupies 14 min.

34 sec.

From the Clubs

LONDON AEROPLANE CLUB

On Friday night, December 9, Miss Jean Batten successfully completed her night flying test for a "B" licence, which was eminently satisfactory considering the strength of the wind which made the journey to Lympne take 65 min. and the return to Croydon 35 min. The annual Christmas turkey-lunch will be held in the club-house on Sunday, December 18, and it is hoped that all members will turn up.

BROOKLANDS

Regular pupils for the period December 1-8 included Messrs. Chizik, Bond, Mayer, Midgley, and Miss Drinkwater. The latter, who is one of the very few women pilots in this country to hold the coveted "B," or Commercial Pilot's, Certificate, has completed a course of blind flying and an Instructor's Course. She will soon be returning to Scotland—her native haunts.

Mr. Opie, who, as mentioned last week, has been doing a lot of flying in the early mornings, made a highly successful first solo before breakfast one day last week. He has done by far the greatest part of his instruction in the early hours, as soon as it is light. He is now progressing towards the "A" licence stage. New pupils include Messrs. Henderson and Frost, and Miss Walker. Mr. Henderson is related to Col. Henderson, who ran one of the first flying schools at Brooklands after the war, and which school later became the present Brooklands School of Flying.

Capt. W. Ledlie, of Personal Flying Services, Ltd., flew over to Ireland in a "Puss Moth," returning to Brooklands the following day. Mr. Hordern and Mr. Van Marken have just returned from Amsterdam and Mr. Van Marken is already off again—this time with Capt. Davis. He hails from Holland, and frequently pays a visit to his home, flying in his own aeroplane. This naturally bears English registration letters, but so that all trace of his home country shall not be lost, he has had the Dutch flag painted on either side of the rudder.

The latest craze to strike the aerodrome is that of ping-pong, and the table in the Club is in constant use. A contest of the "ladder" nature is running, and there is a furious rivalry as to who shall be at the top. Much trouble has been caused by heartless practical jokers who steal in at dead of night and remove the names of those who are out of practice up to the top rung, so that they are challenged by every entrant in turn until they arrive at their rightful place at the bottom. Any member is invited to join in the contest and keep the fun going!

The machines which are acting in the film of The King's Cup have been over to Brooklands to make some final shots before the completion of the film.

NATIONAL FLYING SERVICES, HANWORTH

Fair weather over the week-end kept the machines busy from early morning until sunset, enabling several members to go solo, including Lt. Home Kidston, R.N. (brother of the late Com. Glen Kidston), Dr. E. Hahn, Mr. K. Lotwalla and two members of the Insurance Flying Club. No less than 30 flying hours were recorded on club aircraft during Sunday. On Monday Flt. Lt. Max Findlay and Mr. D. Llewellyn left for a tour of N.F.S. provincial stations, returning on Thursday after carrying out nearly 7 hr. flying. On Tuesday Capt. Parry, piloted by Flt. Lt. J. B. Wilson, flew to Exeter, and on Wednesday Mr. Farquharson carried out a cross-country for his "B" licence, flying from Croydon via Stag Lane to Bristol and return. Lord Clive, Lady Nelson, Lady Clayton and Com. Boswell received dual instruction. On Wednesday a new type of parachute flare was tested which, in spite of fog and strong winds, enabled pilots to make night landings without floodlights. Workshops are busy as several private owners have taken advantage of the poor flying weather to get their machines overhauled. The Chief Engineer and his clerical staff will in future be accommodated in a new wing which has been added to the workshops.

AIR SERVICE TRAINING

A varied amount of flying and ground instruction was carried out at Hamble during November, six pupils taking the three-four years' course completed some of the

tests for their "B" licence. Mr. Hankey completed his first solo successfully, and Messrs. Hancock and Lee qualified for the Blind Flying Certificate, as did also three other pupils. Mr. Giroux is taking the Instructors' Course and Mr. Almond has returned to the School in order to take the Seaplane Course, the Instructors' Course, and the Ground Engineers' Licences.

BRISTOL AND WESSEX AEROPLANE CLUB

Whatever may have been happening in other parts of England, there has been little cause for complaint of the Bristol weather during November and December. As a result, the Bristol and Wessex Aeroplane Club were able to send off three new pupils on their first solo flights and completed the training of another two. Up to date the club flying hours for December show an increase on the flying hours for December last year. The club Squash Rackets Open Competition is now in progress. On December 8 the Bristol and Wessex Aeroplane Club defeated a squash rackets team from the Clifton Club by four matches to one, and on January 8 the Old Radleians are sending a team down to Bristol to play the Aeroplane Club at the airport. A Christmas party is being held in the club-house on December 17, and the club will be closed on December 24, 25 and 26. The airport will, of course, remain open for use throughout the holiday, including Christmas Day.

SURREY AERO CLUB

Gatwick Races, which were held on Wednesday and Thursday of last week, drew quite a number of people to the club for lunches and teas; two very successful private luncheon parties were held each day, and those people who visited the aerodrome for the first time were favourably impressed with the cuisine and proximity of the aerodrome to the racecourse. Mr. R. Brown has commenced his flying for an "A" licence and intends to continue for his "B," and, in spite of the cold weather, we seem to have received quite a number of aerial visitors. The official opening of the automatic clay pigeon trap, which has been installed in a field adjoining the aerodrome, will take place on January 11, when a challenge cup, presented by Mr. F. O. Bezner, will be competed for.

YORKSHIRE AEROPLANE CLUB (N.F.S.)

The Club held its annual Ball at Harrogate on December 2. It was attended by over 200 members and friends, and was a tremendous success. Sunday's brilliant weather accounted for 12½ hours' flying on club machines, and during the week Mr. G. I. Stringer passed his tests for "A" licence. Aerial visitors numbered among them PH-AIK—a Dutch Pander, G-ABA, G-AANB and G-ABWU, the latter flown by Mr. Love, from Southend, and one taxi trip was carried out by Capt. Worrall, from Yeadon to Stag Lane and home again.

MAIDSTONE AERO CLUB

On Saturday, December 10, the annual dance was held and was a great success, many well-known aeronautical people being present. The Club has awakened an extraordinary interest in flying throughout Kent and membership increases rapidly. Mr. Victor Smith's machine is being overhauled by the Club. On Sunday the monthly landing competition was held; the next one will be held on January 15. On New Year's Eve there will be held a "Dress Reform" dance at which everybody is requested to wear those clothes which they consider to be most fitting for a dance at this time of year. Members should note that Tuesday afternoons and evenings are devoted to Bridge parties and Thursday evenings to rehearsals of the Dramatic Society.

COTE HILL AERODROME, RUGBY

By courtesy of the master, Miss Mary Mills, the Waltham Bassett Hounds will meet on the above aerodrome on Boxing Day at 12 noon. To enable flying people to attend, the hounds will be hunted over country adjoining the aerodrome, but will be whipped off in sufficient time to allow aircraft space from which to take off. All who care to come by air will be cordially welcomed, and a supply of petrol will be available.



LONDON'S NEWEST AIRPORT: A Monospar and two "Moths" arriving above the recently opened aerodrome and seaplane base at Gravesend.

LOWE WYLDE'S "BABIES"

In view of the large amount of interest aroused by the recent show of Mr. Lowe Wylde's B.A.C. VII machines with "Douglas" engines, it has been decided to give another display in conjunction with the authorities at Hanworth on December 27. Many interesting events have been arranged for this occasion and, if the approval of the Air Ministry can be obtained, four of these machines will be seen in the air together.

BENGAL FLYING CLUB

October has been a very active month as far as pupils were concerned, seven went solo and five completed "A" licence tests. Mr. Ali, who owns a Comper "Swift," left for Assam on October 13. Mr. A. D. Mookerjea went solo after seven hours dual, and his cousin, who is only 15 years of age, is also doing solo flights. A series of lectures on flying and navigation is being delivered every Friday evening. On October 3 Mr. Scott, of the Forestry Service of Siam, landed at Dum Dum on his way to England in a "Gipsy Moth" and departed three days later. The Hon. Mrs. Montague, piloted by Mr. Belville, arrived from England in a "Gipsy II Moth" which left for Indo-China on October 27. The flying times for the month were dual 69 hr., solo 100 hr., and the number of aircraft in club use three.

ROYAL SINGAPORE FLYING CLUB

On Sunday, October 16, the Royal Singapore Flying Club took part in exercises in conjunction with the Gloucestershire Regiment, the Straits Settlement Volunteer Force and the Johore Military Forces. Briefly, the scheme was that the Gloucestershire Regiment and the Johore Military Forces invaded the Singapore Island, while the Volunteer Force and the Flying Club sought to repel them. Two seaplanes and one landplane were in action, and at a conference held afterwards it was emphasised that in time of emergency the utility of the Club would be great.

LONDON GLIDING CLUB

On Sunday, December 4, the *Professor*, *Kassel 20* and *Crested Wren* were flown together for 35 min., each piloted by an *ab initio* and together totalling 4 hr. It was necessary to use the full length of the ridge from the bowl to just beyond the chalk lion's tail at Whipsnade. The lift was unsteady, but not too strong; nevertheless, flying was made pleasant by brilliant sunshine. Later in the day a fourth *ab initio* carried out a soaring flight in the *Hols der Teufel*. Five gliders, including the two-seater, also made descents from the hilltop. Among the pilots was a commercial aeroplane pilot from France, while an Austrian and a Frenchman were included in the training party. Otto Frischknecht also returned lately to Switzerland with his "B" licence.



Air Ambulance for Bengal

THE Government of Bengal is contemplating the purchase of an aeroplane which will be fitted up as an ambulance. It will be kept at Calcutta and used for conveying serious cases from out of the way districts to the nearest hospital. The Government is also contemplating laying out a series of landing grounds throughout the country.

Gas Attack Precautions for Civilians

THE London section of the St. John Ambulance Brigade is training 7,000 men and women to deal with possible gas attacks from the air; to use their own

words "they are not waiting for something to happen this time, as in days gone by, but making every preparation possible for the protection of the civilian population in the event of war." The aim of the Brigade is to give every man and woman instructions as to the best precautions to take when gas bombs are expected, and what forms of artificial respiration should be applied to those suffering from the effects of gas. Very excellent but better than cure is prevention, which can only be achieved by ensuring that the nation's Air Force possesses machines capable of intercepting the bomb carriers, and destroying or turning them back.

Airport News

CROYDON

THE arrival of Mr. Douglas Fairbanks at Croydon on Sunday, December 4, caused considerable interest, but few recognised the famous singer, Madam Blanche Marchesi, who arrived in the same aeroplane.

Fog at Le Bourget on Monday, December 5, was the cause of six air liners landing at Beauvais. Two of these were the Imperial Airways 9 a.m. and 12.30 p.m. from Croydon to Paris, the remaining four being Air Union machines, also bound for Paris. The passengers completed the journey by train.

Owing to fog on Tuesday, especially in the North of France, Imperial Airways 9 a.m. service to Paris was cancelled. The passengers left later at 12.30, and instead of the usual two inward services there was only one, of Imperial Airways, to arrive from Paris, which left there at 12.35 p.m. All the other services ran to schedule.

Mr. R. A. Jahn returned to Croydon by air from Berlin the same day, after completing a course of training.

The D.L.H. have instituted a training school at Tempelhof Aerodrome, and all their station managers and pilots are required to spend no less than two weeks at the school every winter, where they are instructed in blind flying, and especially in a new system for landing in bad weather by wireless. Everyone must be competent to operate the new system both in the air and on the ground before they finish their course. By this the efficiency of the company's staff, particularly the pilots, is considerably increased. The training school is proving to be of real value, and pilots from other companies on the Continent are also taking the course.

The Airport was again the scene of moving-picture activities on Thursday, when Mr. Gordon Harker, the Cockney butler of the films, amused everyone present by carefully balancing half-a-dozen bottles of beer while running across the tarmac in a vain endeavour to catch the 42-seater air liner leaving for Paris.

Mr. Armour left on Friday, December 9, with one passenger in the "Gull," on a short visit to Geneva.

A heavy fall of snow over an area of nearly 100 miles in the Lyons district on Friday morning was the cause of the Air Union air liner being held up at Marseilles for

over two hours. Ten passengers were on board, all of whom had disembarked from the homeward-bound P. & O. liner ; they were unable to leave Marseilles until 11.10 a.m., but made the journey in good time, however, reaching Croydon at 5.40 in the afternoon.

Capt. G. P. Olley left Croydon, also on Friday, on a five-weeks' trip to Palestine, Iraq and Syria, to obtain cinema pictures of Biblical interest. He was accompanied by Mr. Ernest Schoedsack (who filmed the animal picture "Chang") and Mrs. Schoedsack.

M. Piauneau, a director of the "Louvre," London, who for over twelve months has suffered with a leg complaint for which doctors in London have failed to find a cure, was conveyed on a stretcher by Air Union from Croydon to Paris on Saturday. A specialist in Paris stated that he knew the complaint and believed that he could cure, so M. Piauneau decided to make the journey by air.

Surrey Flying Services, Ltd., have been appointed Croydon agents to Air Taxis, Ltd., of Stag Lane, and in this capacity have taken over an office in the main hall of the administration building. A colour scheme in silver and blue posters for advertising is in preparation, and models of aircraft which are permanently kept by the company at Croydon are on view at the counter.

A new workshop has been opened by Surrey Flying Services, for the exclusive use of pupils taking a course in ground engineering. Many of these pupils are from overseas, and, judging by the number of inquiries which are being received, not only from Canada, British East Indies, Novia Scotia, New Zealand, South Africa, Kenya and many other parts of the Empire, but also from Brazil, Argentine, Japan and Switzerland, it would seem that this new school of engineering has every prospect of success in the future.

K.L.M. are considering the possibility of altering the schedule of their service to Batavia next summer ; they are hoping to arrange to cover the distance of 9,000 miles in eight days, but up to the present a definite programme has not been reached.

The total number of passengers for the week was 997 ; freight, 48 tons 8 cwt.

HORATIUS.

FROM HESTON

ON Monday, December 5, Mr. Armstrong left for Paris in a "Moth," accompanied by Lord de Ramsey ; they had previously flown up from Yeovil. It was heard that they had landed at Beauvais owing to bad visibility, but completed their journey later. Two of our private owners who had stayed the night at the hotel on the airport were waiting anxiously for the ground mist to clear on Tuesday morning, December 6, to enable them to fly off to a meet of the hounds near Upper Heyford. Fortunately, the weather cleared sufficiently for them to proceed. Many private owners are now using their machines to proceed to and from hunt meets. Mr. Whitney Straight arrived from Cambridge in his "Puss Moth." Mr. S. C. Thorp, of Henlys, Ltd., qualified for his "A" licence.

On Wednesday, December 7, Mrs. Spencer Cleaver's "Puss Moth" was brought back by air from Paris. Mr. Christopher Clarkson, of the Aviation Department of Selfridge, Ltd., returned from Paris in the "Monospar" G-ABUZ, where he had been demonstrating the machine during the Paris Aero Show.

Among the visitors on Thursday, December 8, were Dr. Wallace in a "Moth" and Capt. Sala, the French Air Attaché, in the French Government "Moth" to say "Good-bye" on relinquishing his appointment and to introduce his successor. Capt. Sala is being attached to the French Naval Air Service. Capt. Birkett, of Birkett Air Service, left for Paris in a "Puss Moth" with two passengers, and one "Puss Moth" left Paris for Heston but owing to bad visibility landed at Croydon.

On Friday, December 9, M. Nicolesco left for Paris in a "Puss Moth." Banco took an invalid to Berck and made the return journey with the "Puss Moth" in the quick time of 1 hr.

Heston is shortly losing one of its most popular members. Mr. Eric Nelson, who has been in charge of Avro Service there, is taking up the appointment of lecturer at the Aeronautical Engineering College at Brooklands.

Airwork School of Flying will be closed for the Christmas holidays from Saturday to Tuesday, December 24 to 27 (both dates inclusive).

Bristol Airport

THE traffic records at the Bristol Airport show that for the period April 1 to October 31 there was an increase of nearly 50 per cent. on the figures for 1931 ; this increase refers chiefly to aircraft visiting the airport from other aerodromes and fare-paying passengers making use of the aerodrome, and does not include flying of the Bristol and Wessex Aeroplane Club. The Bristol-Cardiff

air service is more than justifying its operation during the winter months, and if the winter figures can be taken as a guide, it looks as though a larger aircraft with a greater seating capacity will have to be taken into use in the early spring. During the past week the Airwork Bristol Branch has again found it necessary to send an S.O.S. to Heston for additional staff to deal with the work which they have in hand, chiefly C. of A. renewals and engine overhauls.

"AN ADVENTURE IN OIL"

JOURNALISTIC treatment of technical subjects is often condemned for revelling in what is contemptuously termed "the popular touch." The truth is, however, that "the popular touch" often succeeds in rendering dry technicalities readable where the severely academic treatment leaves them undigestible. To explain successfully a technical subject to the lay mind is a feat of creative imagination. These remarks are invoked by a publication received from Shell-Mex & B.P., Ltd., called "An Adventure In Oil," and written by Mr. E. P. Leigh-Bennett. Here we are conducted on a tour to Shellhaven and other refineries, and given impressions that the unimaginative lay mind would receive but could not express. Cold facts, however, are not avoided, and so apart from the picture unveiled to us, we learn many interesting things. The deepest oil well in being to-day is over 10,000 ft., and with regard to the richness of yield we learn that a generous well may be extremely embarrassing to the owners. Sometimes a "gusher," as such a well is called, will deliver 10,000 tons or more a day, causing great monetary loss and damage to surrounding property. One Mexican well produced at a certain period 25,000 tons per day. Such extravagance often flows without any warning.

We all associate devastating fires with oil fields, and it is interesting to hear that the usual method of dealing with them is to draw a package of dynamite on a suspended cable to the flames, and the inevitable explosion blows out the flames.

Shellhaven is situated along the Thames, and covers about 100 acres of ground, its 160 tanks having a total capacity of 11,500 tons, or 2½ million gallons each. A normal stock is about 300,000 tons.

There are 26 miles of pipe-lines creeping around the place for transporting this enormous amount of fuel about. In the lubricating oil plant 80,000 tons a year are distilled. At the company's Stanlow Refinery on the Manchester Ship Canal the storage capacity is 30,000,000 gall., and they produce daily 500 tons of bitumen, 500 tons of distillate, and 100 tons of spirit for the needs of Wales, the Midlands and the North. At Llandarcy, near Swansea, is another Refinery, opened in 1922. Eighty-five



SHELLHAVEN : Main Distribution Pipe Lines. There are twenty-six miles of pipe-line at this Refinery near the mouth of the Thames.
(*"Daily Herald"* Photo.)

tankers, with a total deadweight capacity of over 750,000 tons, ply regularly between the source of the crude oil supply, Persia, and Llandarcy. We can, however, make our own crude oil and its by-products from shale, of which vast accumulations lie deep below the surface of the Lothian ground in Scotland. Hundreds of thousands of tons of shale are mined and retorted every year and produce motor spirit, naphtha, lamp oils, power oil, candles, paraffin coke, sulphate of ammonia, etc.

At Grangemouth Refinery of the company, on the Firth of Forth, they deal exclusively with imported Persian crude oil, the "through-put" being 1,000 tons of petroleum per day. The storage capacity is 48,000,000 gallons.

Apart from its interesting story "An Adventure In Oil" contains many illustrations, the cover in particular being appropriately illustrated with a close-up view of an oil ditch. Readers who want more information about this interesting subject should write Shell-Mex & B.P., Ltd., Shell Corner, W.C.2.



Breguet History

No. 10 of Vol. IV of the *Chronique des Avions Louis Breguet* is one of the most interesting "house" publications we have seen for a very long time. It deals in photographs and text with the evolution of Breguet aeroplanes, and is a welcome reminder not only of the fact that Louis Breguet is one of the pioneers of aviation, but also of the fact that in many ways his early machines were far ahead of their time as regards structural methods. The early Breguets were, in fact, the first monospar machines. The biplane wings had single steel-tube spars placed where it was thought the centre of pressure would be. Unfortunately, the wing section used was not one with stationary c.p. The wing ribs were free to pivot around the spar tube, but were restrained from doing so by steel springs. It is not beyond the bounds of possibility that a modern version of this type of construction, using wing sections with small c.p. travel, and perhaps a built-up tube spar instead of the drawn seamless tube of small diameter, might be a useful structure. The Breguet fuselage also had a monospar structure in that the compression member was a steel tube placed roughly on the centre line, and braced by wires. The tail was of cruciform type, and carried on a universal joint. One result of this was that the control wheel danced about in the cockpit when the machine was taxiing, and used to threaten to knock the pilot's teeth out. In fact, on one

occasion we remember a pilot being knocked out completely by being hit by the wheel! But Louis Breguet persevered (he was himself a fine pilot in those days), and it is interesting to learn from the latest number of the house journal of the firm that Louis Breguet has now been designing and experimenting for 28 years. All will wish him every possible good fortune in the future, and we hope that it will be granted him to guide the destinies of his firm for many years to come, to the prosperity of the firm and to the gain of aviation in general.

FFFFF . . . !

We quote the following from the *Morning Post*:— "With the full pomp of an official order, the Air Ministry has stated that in future Flights of the Fleet Air Arm in aircraft carriers, whether armed with two-seater fighter reconnaissance aircraft or single-seater fighters, or a mixture of both types, are to be called 'Fleet fighter flights.' As an example, the following 'feet fighter fight' is given: No. 401 (F.F.) Flight (fighting). The question is being asked in the Service if this is a sobriety test or a musical direction, and a junior Flying Officer has risked having his leave stopped by sending his Flight Commander a buff slip containing the following query: 'If five Fleet Fighter Flights form four formations in five minutes, how many minutes will four formations of Fleet Fighter Flights take to form five flights for the Fleet?'"

THE ROYAL AIR FORCE



London Gazette, December 6, 1932

General Duties Branch

Group Capt. R. E. C. Peirse, D.S.O., A.F.C., is appointed Director of Operations and Intelligence, Air Ministry (and Deputy Chief of the Air Staff) (Temporary) (Nov. 23).

The following Pilot Officers on probation are confirmed in rank:—V. G. Govett (Oct. 28); F. B. Bristow, C. C. McMullen (Nov. 17).

The following Pilot Officers are promoted to rank of Flying Officer:—A. J. Hicks (Nov. 6); H. R. Graham, R. H. Hobbs, D. Scorgie, L. C. Snee (Nov. 10); W. J. Hickey (Nov. 13).

The following are promoted with effect from Dec. 1:—Flight Lieutenants to be Squadron Leaders.—R. M. Trevethan, M.C., R. M. Foster, D.F.C., S. C. Strafford, D.F.C., A. MacGregor, M.B.E., D.F.C., D. L. Blackford, I. M. Rodney, H. T. Lydford, A.F.C., F. L. Hopps, A.F.C., C. H. Stilwell, C. E. Maitland, D.F.C., A.F.C. Flying Officers to be Flight Lieutenants.—R. J. D. Drummond, G. I. L. Saye, M. Lowe, G. F. Simond, M. Griffiths, P. F. G. Bradley, E. C. I. Edwards, J. C. A. Johnson, V. Q. Blackden, P. L. P. Maret, H. A. Constantine, S. L. Blunt, J. E. MacCallum, L. S. Snaith, C. S. Ellison, F. J. Taylor.

F/O. K. S. Brake is promoted to rank of Flt. Lt. with effect from Dec. 1, and with seny. of June 1 (immediately following Flt. Lt. W. L. Freebody on gradation list); Air Vice-Marshal E. R. Ludlow-Hewitt, C.B., C.M.G., D.S.O., M.C., is placed on half-pay list, Scale B (Dec. 4); Flying Officer F. L. P. Henzell is placed on half-pay list, Scale B (Dec. 2).

Stores Branch

The following are promoted with effect from Dec. 1:—Flight Lieutenants to be Squadron Leaders.—W. A. Glasper, J. S. Browne, A.F.C., E. L. Ridley, L. H. Vernon. Flying Officers to be Flight Lieutenants.—F. E. R. Dixon, M.C., M. H. Jenks, F. W. Felgate, L. W. Park.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Squadron Leader L. N. Hollinghurst, O.B.E., D.F.C., to No. 20 (A.C.) Sqdn., Peshawar, 9.11.32, to Command, vice Sqd. Ldr. L. O. Brown, D.S.O., A.F.C.

Flight Lieutenants: L. Young, to No. 405 (F.F.) Flight, 9.11.32. A. P. Bett, to No. 216 (B.T.) Sqdn., Helipolis, 14.11.32. W. H. Burbury, to Experimental Section, Royal Aircraft Estabt., S. Farnborough, 28.11.32.

Flying Officers: D. W. Lydall, to No. 4 (A.C.) Sqdn., S. Farnborough, 25.11.32. C. P. Villiers, to R.A.F. Depot, Middle East, Aboukir, 17.11.32. W. S. Reed, to Air Armament School, Eastchurch, 27.11.32.

Stores Branch

Squadron Leader E. M. Cashmore, to No. 4 Stores Depot, Ruislip, for Stores duties, vice Sqd. Ldr. F. Tedman, M.B.E., 19.12.32.

Flight Lieutenants: E. G. Keeping, to School of Store Accounting and Storekeeping, Cranwell, 1.12.32. D. A. W. Sugden, to Station H.Q., Manston, 28.11.32.

**Designations of Squadrons and Flights**

FROM the operational and administrative point of view, it is considered desirable by the Air Ministry that the functional character of the unit should, where possible, be embodied in its title for convenience of identification. The only exceptions to this rule will be the units previously designated Coastal, Reconnaissance Units, the full title of which will now be as in the following example:—No. 201 (Flying Boat) Squadron; and the abbreviated title, 201 (F.B.) Sqn.

The following table shows, in the second and third columns, examples of the respective titles of the remaining squadrons and of Fleet Air Arm flights that are invariably to be used in official correspondence and in orders in the field.

Function	New full Title to be used in official Correspondence	Abbreviated Title, for use in Orders in the Field
Fighting ..	No. 1 (Fighter) Squadron ..	1 (F.) Sqn.
Army co-operation ..	No. 2 (Army Co-operation) Squadron	2 (A.C.) Sqn.
Bombing ..	No. 7 (Bomber) Squadron ..	7 (B.) Sqn.
	No. 502 (Ulster) (Bomber) Squadron	502 (B.) Sqn.
	No. 600 (City of London) (Bomber) Squadron	600 (B.) Sqn.
Torpedo bombing ..	No. 36 (Torpedo-Bomber) Squadron	36 (T.B.) Sqn.
Transport and bombing ..	No. 70 (Bomber Transport) Squadron	70 (B.T.) Sqn.
Communications ..	No. 24 (Communications) Squadron	24 (Comm.) Sqn.
Fleet Air Arm:		
Fighting ..	No. 401 (Fleet Fighter) Flight	401 (F.F.) Flt.
Fighting and reconnaissance ..	No. 407 (Fleet Fighter Reconnaissance) Flight	407 (F.F.R.) Flt.
Spotting and reconnaissance ..	No. 440 (Fleet Spotter Reconnaissance) Flight	440 (F.S.R.) Flt.
Torpedo and bombing ..	No. 460 (Fleet Torpedo Bomber) Flight	460 (F.T.B.) Flt.

Flights in carriers will be called Fleet Fighter Flights, whether they are armed with two-seater fighter reconnaissance aircraft, single-seater fighters, or a mixture of both types of aircraft. Two-seater fighter flights embarked in cruisers will be known as Fighter Reconnaissance Flights.

(i) In special cases where, for administrative reasons, it is particularly necessary to describe the function of a squadron more fully, the following

Accountant Branch

Gazette, Oct. 18 concerning Sqd. Ldr. G. N. Simon is cancelled.

Medical Branch

F/O. C. R. Palfreyman, M.B., B.S., is promoted to rank of Flt. Lt. (Dec. 1); Flt. Lt. B. B. Kennedy, M.B., B.Ch., resigns his permanent commn. (Nov. 14).

Memoranda

The permission granted to Capt. G. R. Pollard to retain his rank is withdrawn on his conviction by the Civil Power (Oct. 20). The permission granted to Sec. Lt. H. Gamage to retain his rank is withdrawn on his conviction by the Civil Power (Oct. 24).

ROYAL AIR FORCE RESERVE RESERVE OF AIR FORCE OFFICERS

General Duties Branch

M. F. Ogilvie-Forbes is granted a commn. in Class AA (ii) as a Flying Officer (Nov. 18). The following are transferred from Class A to Class C:—Flt. Lt. G. Birckett (Dec. 5); Flying Officer G. P. Olley, M.M. (Dec. 4). The following Flying Officers relinquish their commns. on completion of service:—C. Langley (Oct. 21); J. C. McCormick (Dec. 2); G. C. W. Dufty (Dec. 5). F/O. J. A. Rudd relinquishes his commn. on completion of service and is permitted to retain his rank (Dec. 5).

SPECIAL RESERVE*General Duties Branch*

F/O. C. C. Ellis relinquishes his commn. on account of ill-health (Dec. 7).

Medical Branch

Flight Lieutenant P. J. Nyhan, to Station H.Q., Upper Heyford, 5.12.32.

Flying Officers: H. J. Melville, to Station H.Q., Boscombe Down, 5.12.32. J. Holt (Med. Quartermaster), to Palestine General Hospital, Sarafand, 14.11.32.

Dental Branch

Flying Officer C. R. Stone, to No. 1 School of Tech. Training (Apprentices), Halton, 5.12.32.

NAVAL APPOINTMENTS

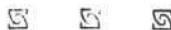
The following appointment has been made by the Admiralty:—

Lieut.-Commr. J. F. M. Robertson (F.O., R.A.F.), to Albury (Dec. 12).

PROMOTIONS

The following officers have been promoted to the rank of Lieut., seniority as stated:—

Sub-Lieuts. I. R. Sarel (F.O., R.A.F.), L. C. B. Ashburner (F.O., R.A.F.) (Oct. 16).



abbreviations may be used:—Single-engined bomber, S.E.B.; twin-engined bomber T.E.B.; general purpose, G.P.

The addition of "(D)" or "(N)" after the first two of the above abbreviations will signify "Day" or "Night" respectively, e.g., twin-engined day bomber, T.E.B. (D).

The Royal Air Force Memorial Fund

The last meeting of the Council for the current year was held at Iddesleigh House, on December 7. There was a large attendance, including Sir Charles McLeod, Chairman and Honorary Treasurer, and Dame Helen Gwynne-Vaughan, and other members.

The usual financial resolutions having been carried, the Chairman informed the Council of two generous donations received from the Air Council recently.

The Council heard with very great regret of the resignation from membership of the Vanbrugh Castle School Committee of two members, Mrs. B. H. Barrington-Kennett, who has been a member for many years, and also Mrs. F. Vesey Holt; and also the Chairman of the Committee, Air Vice-Marshal A. E. Burton, C.B., resigned the chairmanship of the Committee, but remains a member. Regarding the same Committee, the Council approved of the nomination by the Air Council of a new member, Mrs. MacNeece Foster, wife of Air Commodore W. F. MacNeece Foster, C.B.E., and they also approved of membership of the Committee being offered to Air Vice-Marshal A. M. Longmore, C.B.

The Council were informed that on Sunday, November 6, Air Chief Marshal Sir J. M. Salmon, G.C.B., at the request of the Council, laid a wreath on the R.A.F. War Memorial, Whitehall Stairs, Victoria Embankment, S.W.1, when representatives of the Dominions of Canada and New Zealand, Members of the W.R.A.F., O.C.A., Comrades of the Royal Air Forces, and others, laid wreaths at the foot of the Memorial; and the Council also provided a wreath which, at their request, was placed on the Stone of Remembrance, High Street, Edinburgh, on Armistice Day, November 11, in the presence of H.R.H. the Prince of Wales, and representatives of the Royal Navy and Army and the Royal Air Force.

The Secretary was directed as usual to prepare an annual report for the current year for distribution in the Spring.

The next meeting of the Council was fixed for Wednesday, March 8, 1933, at the offices of the Fund at 3 p.m.

The usual Meeting of the Grants Committee of the Fund was held at Iddesleigh House, on November 10. Mr. W. S. Field was in the Chair, and the other Members of the Committee present were:—Mr. L. M. K. Pratt Barlow, O.B.E., Air Commodore B. C. H. Drew, C.M.G., Mrs. F. Vesey Holt. The Committee considered in all 19 cases, and made grants to the amount of £215 8s. 4d.

At the meeting held on November 24, Mr. W. S. Field was in the Chair, and the other Members of the Committee present were:—Air Commodore B. C. H. Drew, C.M.G., Mrs. F. V. Holt, Squadron Leader H. G. W. Lock, D.F.C., A.F.C. The Committee considered in all 20 cases, and made grants to the amount of £484 6s. 6d.

The Industry

Electric Furnace Patents

WE are informed that Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, North Road, Holloway, N.7, and Birmingham Electric Furnaces, Ltd., Birlec Works, Tyburn Road, Erdington, Birmingham, have recently reached an agreement between themselves for the interchange of information and rights under their respective patents and patent applications relating to electric furnaces employing centrifugal fans, and to the air circulation methods used with such fans. The arrangement will give the furnace users the benefit of the combined experience of both these well-known firms in respect of fan furnaces, and will enable the growing demand for low-temperature operations, such as the tempering of steel and the heat-treatment of aluminium and its alloys, to be met in an increasingly efficient manner. Further research and experimental work in connection with fan furnaces is being carried out by both firms and the ultimate results will, it is believed, be of value to all manufacturers whose processes require heat-treatment.

Repairs at Penshurst Aerodrome

MESSRS. F. J. V. HOLMES and A. N. KINGWILL, together with much help from the indefatigable Mrs. Holmes, have transformed the hangars at Penshurst. The visitor there, instead of bare Air Ministry hangars, will now find comfortable offices and light, well-equipped workshops laid out ready to cope with aircraft overhauls of all kinds. Mr. Holmes is well known as one of the pioneers of joyriding in this country, and for many years his company, Berkshire Aviation Tours, Ltd., carried passengers in large numbers in England, Scotland and Wales. Last year, for example, under the name of Air Travel, Ltd., their fleet took up over 15,000 passengers per machine. Having now established these workshops at Penshurst, they are in an admirable position to undertake repairs and overhauls at short notice. They carry large stocks of spares for Avros, and also "Le Rhone," "Clerget," "Renault," "Mongoose" and "Lynx" engines, while those who are interested in actual joyriding should certainly run down to Penshurst and have a yarn before finally laying down their plans for next year.

The First D.H. "Dragon"

THE christening of Mr. Hillman's first two-engined aircraft—the new de Havilland "Dragon" (D.H. 84—two "Gipsy Majors")—has now been definitely fixed for December 20 at 12 noon. It is hoped that Mrs. J. A. Mollison can perform the ceremony of naming the machine "Maylands," after the village where the Romford Aerodrome is situated. Mr. Hillman is inviting a number of guests and buffet refreshments will be served. There will be opportunities of taking passenger flights in the machine. In view of recent rumours it is worth noting that Mr. Hillman does not propose to operate any air lines from Gatwick, and the question of air services other than inland air lines is still "in the air."

BOOK REVIEWS

The Air Mails of British Africa, 1925-32. Compiled by N. C. Baldwin (Francis J. Field, Ltd., Sutton Coldfield). Obtainable from FLIGHT Office. Price 2s. 8d., post free.

THE name of Francis J. Field is well known to collectors of Air Mail stamps and covers, not only as a "Universal Provider" of the latter items, but as a publisher of very informative and useful accessories to the popular hobby of aero-philately. *The Air Mails of British Africa* is the latest effort, and we are bound to say that the compiler, Mr. N. C. Baldwin, has succeeded in producing a work which should not only serve as a useful reference for airmail collectors, but also provide much of interest to the general reader regarding flights to and from Africa.

Briefly, it contains short descriptions of the various flights which have been made to, from and in Africa from 1925 to the present day. Where mails were carried, details are given, together with illustrations, maps and diagrams of the number and description of letters carried, stamps, cachets, postmarks, etc. Priced check lists of

various "First Flight" and "Special" covers are also given, which are both useful and interesting.

Altogether, quite an excellent addition to aerophilatelic literature.

"Patents, Trade Marks and Designs." Their Commercial Aspect and Development. By C. W. Thomas. (Ocean Publishing Co., 1932.) Obtainable from FLIGHT Office. 5s. post free.

THIS book, brief though it is, contains forceful arguments and sound general reasoning, on the expediency of taking advantage of monopoly protection. It will provide answers to those who have questions on the ever-difficult problem of "how to exploit." It is recommended for the office reference-shelf of works-managers and D.O. staff.

W. J.

"The Camels are Coming." By W. E. Johns (John Hamilton). Obtainable from FLIGHT Office. Price 8s. post free.

THIS book records a series of incidents taken from the active service experience of an officer, whom the author states is a fictitious character, but typical of war pilots, "daring and deadly when in the air, devil-may-care and debonair when on the ground." The alliteration may be attractive, but the sentiment expressed will, perhaps, be distasteful to all who did war service in the air. However, the book is written in an attractive style which brings out the excitement and humour of a pilot's life during the war, at the same time not unduly stressing the horror in which so many authors of war books seem to glory.

IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see FLIGHT for January 25, 1912.

For 1912 and 1913, see FLIGHT for January 17, 1914.

For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1930 being given in FLIGHT, January 16, 1931.

	Imports.	Exports.	Re-exports.	
	1931.	1932.	1931.	1932.
	£	£	£	£
Jan. . .	7,965	2,456	142,596	122,942
Feb. . .	3,303	2,503	110,587	181,482
Mar. . .	5,615	1,946	83,088	167,195
April . .	2,216	622	213,401	142,145
May ..	1,964	1,747	275,382	138,356
June ..	6,780	398	78,298	126,330
July ..	1,790	1,070	177,006	142,702
Aug. ..	3,556	511	153,834	111,073
Sept. ..	1,088	2,161	218,987	115,464
Oct. ..	1,863	1,511	124,810	192,361
Nov. ..	3,097	182	124,374	113,181
	39,237	15,107	1,702,363	1,533,231
			15,927	2,695

NEW COMPANY REGISTERED

THE HELICOPTER PRIVATE PROPRIETARY CLUB, LTD., 106, High Street, Camden Town. Capital: £1,000 in 1d. shares. The objects are to establish and maintain a club. Life directors:—V. V. Dibovsky, C.M.G., 106, High Street, Camden Town, N.W.1, aeronautical engineer (director of Helicopter, Ltd.); S. Boone, 500, Archway Road, N.6, private secretary (director of Helicopter, Ltd.); Miss Edith E. Miller, 12, Lismore Circus, Hampstead, N.W. 5, accountant.

Increase of Capital

BENDIX PERROT BRAKES, LTD. (Birmingham).—The nominal capital has been increased by the addition of £60,000 in £1 ordinary shares beyond the registered capital of £60,000.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m = motors
(The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1931

Published December 15, 1932

14,972. A. SOLDENHOFF. Flying machines. (383,637.)

APPLIED FOR IN 1932

Published December 15, 1932

1,086. WRIGHT AERONAUTICAL CORPORATION. Cooling and cowling of aircraft engines. (383,792.)